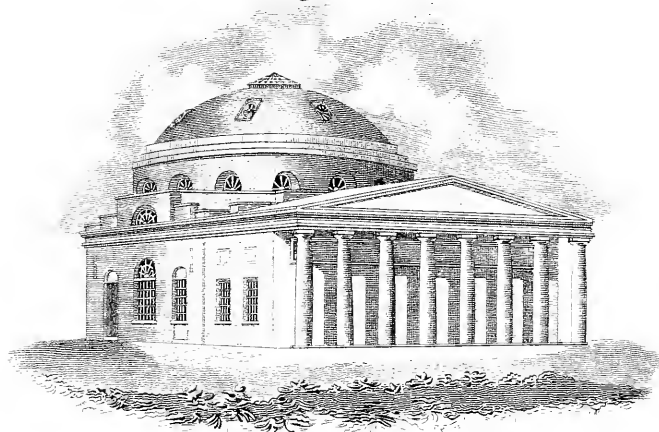


SEP 14 1893

LIBRARY
OF THE
School of Medicine



University of Maryland





Digitized by the Internet Archive
in 2011 with funding from
LYRASIS Members and Sloan Foundation

BULLETIN
OF THE
SCHOOL *of* MEDICINE
UNIVERSITY OF MARYLAND



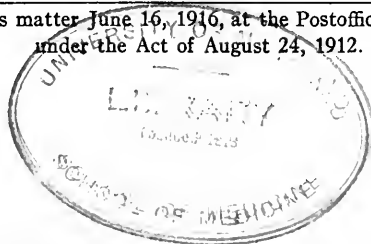
VOLUME 27 No. I

Publishers:
FACULTY OF PHYSIC
UNIVERSITY OF MARYLAND
BALTIMORE

PUBLISHED FIVE TIMES A YEAR
(JANUARY, APRIL, JULY, SEPTEMBER AND OCTOBER)

Lombard and Greene Streets
Baltimore, Md.

Entered as second-class matter June 16, 1916, at the Postoffice at Baltimore, Maryland
under the Act of August 24, 1912.



26784

BULLETIN

OF THE

SCHOOL OF MEDICINE

UNIVERSITY OF MARYLAND

Vol. 27

JULY, 1942

No. 1

THE TRANSFER OF GASES IN THE BODY: SOME MILITARY ASPECTS*†

ROBERT H. OSTER, PH.D.

BALTIMORE, MD.

As it becomes more and more apparent that aerial dominance is the key to victory in the present war, the air force and engineers of each belligerent nation strive to achieve the maximum in speed, altitude, and range of both pursuit and bombing planes. By increasing the engine power and decreasing the wind resistance they strain to get the maximum speed in horizontal flight, in climb, and in diving. By means of superchargers and many motors, altitudes beyond the accurate fire of antiaircraft guns are being obtained. The great fuel capacity of these big bombers permits long flights at high altitudes if the important condition that the human operators can "take it" is met.

To achieve these superspeeds and stratosphere heights the engineer and physicist have set the pace and determined the limits of plane structure and motor power. Only recently have the physiologist and flight surgeon been called upon to prescribe for that much more delicate and relatively fragile engine, the human pilot, gunner, bombardier, or navigator. Redesigning the human engine for increased performance is not done in months or centuries.

The physiologic problems set up are thus numerous and complicated. In power dives of 600 miles an hour the pullout from the vertical path sets up centrifugal forces acting on the blood column and body organs which usually produce loss of vision and loss of consciousness by the pilot. Abdominal supports, the crouching position of the pilot, and other devices have helped to counteract the effects, but the upper limit of endurance from the pilot's

* From the Department of Physiology, School of Medicine, University of Maryland.

† Received for publication May 20, 1942.

standpoint is still below the military need and plane strength. This problem is only one of many encountered in military physiology and medicine.

As Behnke and Stephenson (1) have pointed out, the United States allowed aviation research to almost lapse for many years after the first World War as far as medical and physiologic problems were concerned. The single laboratory maintained by the government has done good work and a great expansion will help matters, but the urgency is great. The younger surgeons, internists and physiologists now beginning to serve the aviation forces will need to grasp the fundamentals of the problems to be faced as rapidly as conditions will permit. The most recent work cannot be reported, but a brief review of some of the aspects of the transport of gases within the body may be of some value. This latter problem is one of the most important encountered in military medicine.

OXYGEN

High altitude flying exposes the pilot to reduced atmospheric pressure and, hence, the possibility of anoxia with its effects on respiration, reaction time, vision, blood circulation, and the whole gamut of behavior patterns dependent on cortical neurones. High altitude also involves low temperatures, which in turn influence the means by which oxygen can be supplied and body temperature and normal metabolism maintained.

The supply of oxygen to arterial blood at high ambient pressures, as in deep-sea diving and the escape from submarines, sets up another group of problems in which the pressure change and the transport of the inert gases become the important factors.

Altitude. The study of the changes produced by high altitude and reduced atmospheric pressure has had a long and interesting history. Balloon ascents (2, 3), low pressure chambers in which the conditions of high altitude could be simulated (4), and scientific expeditions to high mountains, such as those of Haldane, Henderson, and Schneider in 1911 and Barcroft, et al. in 1922, have served to explain many of the physiologic changes associated with high altitude conditions.

However, high altitude, with its concomitant reduced partial pressure of not only oxygen but also nitrogen and other air constituents, introduces new problems when it is attained in a rapid climbing aircraft. In 1939 the rates of climb were as high as 1000 feet per minute. At present with the use of powerful interceptor planes they are undoubtedly far greater. This rapid change in pressure does not allow enough time for compensatory mechanisms to become effective, with resulting appreciable effects on the central nervous system. At the same time, equilibrium between the dissolved inert gases and the external atmosphere cannot occur and bubble formation takes place.

Armstrong (5) has pointed out that the altitude attained is the most important variable in aviation, unless the external pressure can be maintained

as in a sealed cabin or pressure suit. At 10,000 feet the alveolar oxygen has dropped to 67 mm. of mercury. However, the association characteristics of the hemoglobin-oxygen system of arterial blood are such that the arterial blood saturation with oxygen has only decreased by about 9 per cent when air is breathed. It is at this altitude (8000 to 12,000 feet) that those individuals having poor compensation for anoxia or susceptibility to high altitude sickness get into difficulties. Beyond 12,000 feet the oxygen saturation curve drops rapidly and at 27,000 feet arterial saturation is down to 50 per cent. The content of oxygen in air being 20.96 per cent, the oxygen partial pressure at this altitude will be $.2096 \times 256$ mm. of mercury or 53.66 mm. of mercury. Most people will die in twenty to thirty minutes at 25,000 feet.

By using a mask and breathing oxygen this 50 per cent saturation level does not occur until 47,000 feet is reached. Without a pressure cabin or suit the limits of human tolerance are actually reached below this point. Since the alveolar air is always saturated with water vapor with its own partial pressure of 47 mm. of mercury, this must be subtracted from the total atmospheric pressure at all altitudes. Only comparatively recently was it realized that carbon dioxide, being steadily given off from the blood in the capillaries, also maintained a partial pressure of 39 mm. of mercury in the lung. The sum of these two partial pressures (47 mm. of mercury for water vapor and 39 mm. of mercury for CO_2) or 86 mm. can thus account for the total atmospheric pressure at 50,313 feet and the alveolar oxygen partial pressure will be zero. Thus, the curves relating the oxygen saturation of arterial blood to altitude, for both breathing air and breathing oxygen, come together (zero saturation) at 50,313 feet and only by using means of maintaining the pressure surrounding the body at higher levels (such as the pressure corresponding to 12,000 feet, i.e., 480 mm. of mercury) can such high altitudes be tolerated.

Compensation. With the development of partial anoxia the several compensatory mechanisms come into play. The hemoglobin of the blood leaving the lungs is less saturated with oxygen and less oxygen is available to the neurones of the respiratory center. This slight oxygen decrease may act as a weak stimulus to the center and result in increased lung ventilation. The increased ventilation, however, causes the loss of more carbon dioxide, with a resultant decrease in the concentration of the latter in the neurones controlling respiration. Carbon dioxide is a far more effective stimulating agent for the respiratory center neurones than oxygen (8), and with the drop in the stimulus level the ventilation increase is checked. As carbon dioxide again builds up, the respiratory rate is again increased and aids in the oxygen saturation of the arterial blood. The oxygen dissociation curve of the blood is thus shifted to the left.

As anoxia increases, the carotid body and aortic arch chemoreceptors are

stimulated by the reduced oxygen content of the blood (6, 7). Impulses pass from these receptors to the neurones of the respiratory center. The hyperpnea resulting from arterial anoxemia when the carbon dioxide is low is now ascribed to the stimulation of these receptors (7, 8) and they may be considered as forming part of an emergency compensatory system which is much more rugged and resistant to inactivation than the sensitive pontile and medullary neurones.

In cats and dogs some workers (9) have found that these chemoreceptors become active with slight decreases in oxygen saturation of the blood (below 96 per cent). In man, however, they are probably not involved until the arterial saturation drops to the 92 to 95 per cent level, corresponding to oxygen partial pressures of 67 and 90 mm. of mercury. These receptors are resistant to oxygen lack in that they continue to be active when perfused with oxygen-free fluid (8).

The central neurones are depressed or paralyzed by slight anoxia. Cortical cells concerned in the sensations of pain and discomfort are among the first to become inactive as anoxemia progresses. Neurones concerned in the higher pathways involved in correlative processes, self criticism and judgment are affected early. Great differences in the response to anoxia exist. In some individuals euphoria, self satisfaction, hilarity or belligerence may develop, while in others sleepiness, headache and lassitude may be the dominant symptoms. Memory is impaired and the ability to evaluate instrument readings correctly depreciates.

Armstrong (5) and Cannon and Burket (10) give data from various sources showing that cerebral small pyramidal cells cannot survive in the absence of oxygen after eight minutes. Drinker (11) cites data for other centers: The cerebellum becomes inactive after thirteen minutes; medullary centers in twenty to thirty minutes; the spinal cord in forty-five to sixty minutes; sympathetic ganglia in sixty minutes; and the myenteric plexus in 180 minutes. The work of Stella (12) and Pitts, Magoun, and Ranson (13) indicates that the pneumotaxic center in the pons plays an important part in the reciprocal innervation between the inspiratory and expiratory neurones in the medulla. The conduction of part of the discharge from an inspiratory neurone up to Lumsden's pneumotaxic center causes the latter to stimulate the expiratory center, which in turn transmits an inhibitory impulse to the inspiratory center. This constitutes one system controlling the rhythmicity of respiration. Another system involves afferent impulses carried by Hering's nerves in the vagal trunk from the lung tissue to stimulate the expiratory center, and this in turn inhibits the inspiratory center.

When carbon dioxide is present it acts directly on the neurones of the respiratory centers, the latter being much more sensitive than the chemoreceptors and producing a much greater ventilation for the same increase in carbon dioxide.

When carbon dioxide is being blown off rapidly as at low atmospheric pressures, the compensation for low oxygen partial pressures must rest on the chemoreceptors of the carotid body and aortic arch and the function of the vagal-medullary centers reflex. The emergency systems may be further differentiated in that, if the chemoreceptors act by stimulating the pontile pneumotaxic center, the activation of the latter by low oxygen saturation of the blood will put the final protection against anoxemic collapse on the vagal-expiratory center system. Damage to the Hering nerves would then destroy the last effective means of maintaining the necessary rhythmic variation in the central excitatory state of the medullary centers.

Action potentials from the cortical neurones of human beings have been studied under anoxic conditions by Berger (14) and Gibbs and Davis (15). Anoxia in both man and animals apparently decreases the frequency of the dominant waves of the electro-encephalogram. The potential may at first increase, but later it decreases in amplitude. Davis, Davis and Thompson (16) found that subjects breathing 7.8 to 11.4 per cent oxygen showed shorter trains of alpha waves and just before loss of consciousness large delta waves predominated in the record. In connection with these irregularities in the electro-encephalogram during partial anoxic anoxia, the recent findings of Thorner, et al. (17), that poor flyers showed a normal alpha frequency of 8 to 9 per minute or less and the best flyers had a 10 to 10.5 per minute rate, may be significant.

Along with the respiratory mechanisms compensation in the circulation occurs. The same nervous and chemical stimuli which increase the activity of the respiratory neurones also affect the vasomotor and cardio-accelerator neurones. An increase in the carbon dioxide tension of the arterial blood in this region not only causes a dilation of the vessels, but has a direct effect on the neurones controlling circulation. With excessive washing out of carbon dioxide during hyperventilation, constriction of cerebral vessels may lead to cerebral anoxia. At the same time, the stimulation of the respiratory center is decreased and the hyperpnea is diminished, which in turn weakens this most effective means of combating the decreased blood oxygen tension.

Low oxygen in the blood supplying the carotid and aortic bodies excites not only the respiratory neurones in the medulla, but also the cardio-accelerator and vasoconstrictor centers nearby. The increased cardiac output, coupled with a marked peripheral vasoconstriction caused by the reduced carbon dioxide tension in the blood, goes far to speed up the supply of oxygen to the tissues. To compensate for the alkalosis produced by the excess base released by the carbon dioxide loss, the latter is excreted by the kidney at an increased rate. However, the blood remains slightly more alkaline than at sea level, and the hemoglobin-oxygen affinity is increased. At 15,000 feet these compensatory factors cause an increase in alveolar

oxygen tension from 33.8 mm. to 52 mm. of mercury and a maintenance of arterial oxygen saturation at about 80 per cent.

After the reflex stimulus of respiration and circulation by anoxemia has been established, the beginning or resumption of oxygen inhalation at a high altitude removes this dominant stimulus and unconsciousness resulting from a cerebral blood vessel spasm, fall in blood pressure, and even respiratory failure may result (8), especially if the anoxemia has been of considerable duration.

Rate of ascent. If the change to low atmospheric pressure has been gradual, equilibrium between the gases without and those of the bone marrow and deeper tissues of the body can be established without undue discomfort. With a rapid decrease in the atmospheric pressure the effects may be serious. Schneider and his group (18) and Armstrong and Heim (19) have demonstrated the importance of the rate of ascent upon the altitude tolerance. Armstrong (5) points out that the more rapid the ascent the greater the effect on the central nervous system (inactivation of cortex neurones), and the slower the ascent the greater the strain on the circulatory system. A rate of 500 feet per minute seems to be the optimum for ability to endure anoxia over a period of time. At faster rates of climb tissue anoxia develops more rapidly than compensatory forces can take effect. At slower rates of ascent the effects of anoxia accumulate before the desired altitude is reached. Both effects reduce tolerance.

As previously mentioned, a decrease in atmospheric pressure results in definite increases in the ventilation rate, which is vital to the compensation for the decreased oxygen tension. For each 5000 feet rise an approximate increase of 15 per cent in ventilation occurs (20). If the ascent is so rapid that sufficient time is not available for this compensation to occur, cerebral anoxia will soon develop. All aviators should begin breathing oxygen at 10,000 feet. For 35,000 foot altitudes or for exceptionally rapid ascents the use of oxygen should be started before the take-off. At 35,000 feet or higher this oxygen must be supplied under pressure if the altitude is to be maintained for some time.

Armstrong's third variable factor (5) in aircraft operation, i.e., the duration and frequency of exposure to low atmospheric pressures, will depend considerably on inherent tolerance, physical activity as involved in the work of the gunners, navigators and engineer, general physical condition, emotional state, and clinical anomalies. The anoxic effects being accumulative, the compensatory mechanisms may prevent collapse for some time. With inactivation of a key set of neurones such as the inspiratory neurones of the medulla or the more resistant receptors of the carotid body, general collapse and respiratory failure may be sudden. Armstrong and Heim's experiments with conditions at 25,000 feet showed only a moderate drop in

blood pressure, about 40 mm. of mercury and an increase in the respiratory rate until after twenty-five minutes, when a sudden drop in blood pressure and cessation in respiration occurred (19).

This accumulative effect of extreme anoxia also enters into the problem of how long the intervals between exposures must be made to have no deleterious effects. Experiments on animals and man indicate that approximately forty-eight hours should elapse between exposures (18, 19).

NITROGEN AND HELIUM TRANSFER

A change in the external gas pressure upon the body surface must lead to adjustments toward equilibrium between the gases in solution in the body fluids and the external media. The rate at which the change in external pressure occurs will determine the rate and size of bubbles of gas evolving from and passing through the body tissues. In the case of oxygen, the metabolic needs of the tissue cells cause the utilization of all available oxygen. Even with oxygen administered through a Boothby, Lovelace, Bulbulian (B-L-B) mask from a tank, the problem at high altitudes and in rapid ascents is to maintain the blood saturation at a value near the 90 per cent level and not to contend with an excess of oxygen diffusing through the tissues, since the cells are actively changing the oxygen from the gaseous phase into a chemical combination with cellular substrates.

Aeroembolism. For inert or nonabsorbed gases such as nitrogen and water vapor, elimination under conditions of rapidly changing external pressures leads to bubble formation or aeroembolism. Armstrong (13) defines aeroembolism as "The disease produced by a rapid decrease of pressure below 1 atmosphere, such as may occur in aircraft flights to high altitude, and which is marked by the formation of nitrogen bubbles in the body tissues and fluids." This is the same physical process as that encountered in compressed air illness or the "bends," when the diver or caisson worker is being decompressed from a higher to atmospheric pressure. If the diver has been equilibrated to a certain pressure (absolute pressure), the rate of bubble formation will depend on the relative change with reference to the absolute pressure, not according to any fixed change of gage pressure.

As the external pressure is rapidly reduced the tissues are supersaturated with carbon dioxide, nitrogen, and to some extent with water vapor. The blood carries great quantities of carbon dioxide readily because of the chemical binding. Nitrogen, however, must be carried in physical solution. In addition, nitrogen is much more soluble in fats and oils than in water, and body fat at blood temperature dissolves five to six times as much nitrogen per gram as does the blood (21).

Behnke and his co-workers (22, 23) in a series of investigations of nitrogen and helium elimination and absorption in the human body, while breathing

oxygen or oxygen-helium mixtures, showed that at a given pressure the tissues of the body will absorb only about 40 per cent as much gaseous helium as nitrogen, and the time required for elimination of the absorbed helium is about 50 per cent of that required for nitrogen elimination. Exercise, especially during the first thirty minutes, hastens gas elimination from tissues. They state that, "In tissues other than the bone marrow and the spinal cord, gaseous diffusion and a greater circulation of blood tend to equalize nitrogen pressure throughout the body. In the bone marrow and spinal cord the greater nitrogen uptake due to high fat content, the limitation of diffusion by bony walls, and the sluggish circulation appear to be factors responsible for the slow decompression necessary after long exposures in atmospheres of compressed air." They point out that the lower solubility of fat for helium would indicate the desirability of using this gas during prolonged exposures to high pressure atmospheres. The neuromuscular disturbances and alterations in mood which may occur during exposure to high pressures have been ascribed to the narcotic effect of atmospheric nitrogen (24). Helium apparently abolishes the narcotic-like retardation (25). Diminution of the narcotic effects of nitrogen by using helium-oxygen gas mixtures has made possible diving descents to much greater depths than when compressed air is used.

Preoxygenation. Breathing pure oxygen for an hour or so before making a high altitude flight does diminish susceptibility to bends for some time, but the symptoms will appear ultimately. Behnke (26) found that a susceptible subject, if given five hours of preoxygenation, could withstand 40,000 feet for two hours without developing bends. Denitrogenation takes place according to a curve which becomes almost level after five hours' exposure to 99 per cent oxygen (23), and at six hours the process is almost complete. It would not be feasible for fighter pilots or bomber crews to stay in the oxygen chamber for these long periods because of the time factor and the toxic effects of long exposure to pure oxygen. A ninety minute preoxygenation period which raises the bends ceiling to around 34,000 feet should be feasible.

For flights at high altitudes of 34,000 to 40,000 feet lasting for two hours or more, the stay in the oxygen chamber could be made safer by the use of an 80 to 85 per cent oxygen and a 15 to 20 per cent nitrogen. In this way the toxic effects of 100 per cent oxygen could be avoided, at the same time permitting denitrogenation to proceed.

Decompression chamber tests can serve to eliminate the more susceptible pilots. About half of the eighteen to twenty-four year old pilots can withstand 35,000 feet for four hours without great distress. As Fulton (28) has suggested, some drugs may diminish susceptibility to bends. It has been calculated (20) that the maximum rate of ascent without bubble formation

(first in spinal fluid) is seventy-eight feet per minute. The supersaturation of blood occurring with higher rates of ascent would not be important on account of the rapid elimination through the lungs. However, bubbles in the body tissues, which contain about twenty-six times the amount of nitrogen dissolved in the blood, can cause pain or lesions in the central nervous system if exposure is severe and prolonged. Bubbles in the venous circulation may occur which are unable to pass through the pulmonary bed. Along with the pain and temporary disability associated with the presence of emboli sufficient in number to cause anoxia of the nerve or muscle tissue, Behnke and Shaw (27) have shown that air embolism in dogs may go along with hemoconcentration and certain characteristics of shock. They think that this may be linked up with plasma loss through capillaries damaged by anoxia.

CARBON DIOXIDE AND CARBON MONOXIDE

Carbon dioxide, because of its high rate of diffusion through cell membranes and cytoplasm and its efficient transport by the blood through chemical combination with base and with hemoglobin as carbamino compounds, is readily transferred from its point of origin in the metabolizing cell to the external atmosphere. Of the 48 ml. of carbon dioxide carried by 100 ml. of arterial blood, 45 ml. is in chemical combination. About 10 ml. is combined with hemoglobin amino groups and the remainder is carried as bicarbonate. The carbon dioxide is readily released in the lung, as a result of the functioning of Roughton's carbonic anhydrase. Carbon dioxide in great amounts acts as a narcotic to nerve cells, but even in divers working at increased pressure such amounts could not occur with normally functioning apparatus.

The important rôle of carbon dioxide in the control of respiration already has been discussed in relation to oxygen transport. Carbon dioxide does augment the toxic properties of oxygen during long exposure at high concentrations and intensifies the symptoms of nitrogen narcosis in deep-sea divers (1). Inhalation of carbon dioxide apparently increases the tolerance to low oxygen pressures (29).

Carbon monoxide: Although not a constituent of the atmosphere or produced by body tissues, carbon monoxide may be present in closed spaces near operating internal combustion engines. Hemoglobin combines with carbon monoxide 300 times more readily than with oxygen. The affinity is so great that with the carbon monoxide content of air as low as 0.05 per cent the blood will gradually become half-saturated. At 50 per cent saturation Haldane (30) found that breathing and pulse rate were increased, vision and hearing impaired, and intelligence probably greatly impaired. At 56 per cent walking is impossible and 60 per cent saturation is fatal.

Above 35 per cent saturation of the hemoglobin, the nausea and extreme depression are similar to those of mountain sickness.

When the oxygen pressure is low the effects of carbon monoxide become more serious, hence the danger of any of this gas being liberated in the fusilage of a bomber plane, as from engine exhaust pipes used to counteract the extreme cold of high altitudes. A man suffering from carbon monoxide poisoning faints readily on exertion and the dizziness is more obvious than the hyperpnea. As Haldane has indicated, this may be caused by the impaired heart being unable to supply sufficient oxygen to the brain (30).

In carbon monoxide poisoning the respiratory center is relatively less affected, since the partial pressure of arterial blood oxygen remains normal although the total amount of oxygen supplied is much reduced. As previously indicated the concentration of carbon monoxide needed to produce poisoning is low; 0.05 per cent will produce toxic effects.

CONCLUSION

Only a few of the aspects of the transport of gases within the body and between the body and the surrounding atmosphere are discussed here. For oxygen supply alone many fundamental problems need to be solved. It is not known whether the important emergency chemoreceptor discharge acts upon the pontile pneumotaxic center or upon the lower medullary centers directly controlling inspiration and expiration. From the practical military standpoint it is debatable whether chemoreceptor dysfunction is more or less important than impairment of the Hering-Breuer reflex arc in determining a pilot's susceptibility to low oxygen pressure. The vitamins and dietary factors in aiding resistance to anoxia and nitrogen narcosis are worth further study. The direct effects of oxygen lack and carbon dioxide excess are intimately linked up with the hydrogen ion concentration of the blood. Factors which affect the acid base balance of the blood before ascent to high altitudes or which aid or hinder the kidney in producing the partially compensated alkalosis under anoxic conditions need further study.

The range of military flying, now reaching 40,000 feet or higher and extending to the arctic zone, has increased the problems caused by low temperatures. At 30,000 feet the temperature is 40 degrees below zero F. and at 40,000 feet, 60 degrees below zero. Along with the severe drain on the flyer's energies required to maintain mental and muscular activity and near-normal body temperature is the freezing up of oxygen lines at a time when more oxygen is required. Solution of these problems alone will go far to decide the duration and outcome of the present conflict.

BIBLIOGRAPHY

- (1) BEHNKE, A. R. AND STEPHENSON, C. S.: Applied Physiology. *Ann. Rev. Physiol.*, 4: 575, 1942.

- (2) BERT, P.: *La Pression Barometrique*. Masson et Cie, Paris, 1878.
- (3) PICCARD, J.: *Nat. Geogr. Mag.*, **63**: 353, 1933.
- (4) HILL, L. AND GREENWOOD, M.: On the Formation of Bubbles in the Vessels of Animals Submitted to a Partial Vacuum. *Jour. Physiol.*, **39**: 23, 1910.
- (5) ARMSTRONG, H. G.: *Principles and Practice of Aviation Medicine*. Williams & Wilkins Co., Baltimore, 1939.
- (6) COMROE, J. H., JR. AND SCHMIDT, C. F.: Reflexes from the Carotid Body (Glomus Caroticum) to the Respiratory Center of the Dog. *Am. Jour. Physiol.*, **119**: 290, 1937.
- (7) SCHMIDT, C. F. AND COMROE, J. H., JR.: Functions of the Carotid and Aortic Bodies. *Physiol. Rev.*, **20**: 115, 1940.
- (8) SCHMIDT, C. F.: *Macleod's Physiology in Modern Medicine*. C. V. Mosby Co., St. Louis, p. 610, 1941.
- (9) EULER, U. S. v., LILJESTRAND, G., AND ZOTTERMAN, Y.: The Excitation Mechanism of the Chemoreceptors of the Carotid Body. *Skandinav. Arch. f. Phys.*, **83**: 132, 1939.
- (10) CANNON, W. B. AND BURKET, I. R.: The Endurance of Anemia by Nerve Cells in the Myenteric Plexus. *Am. Jour. Physiol.*, **32**: 347, 1913.
- (11) DRINKER, C. K.: *Carbon Monoxide Asphyxia*. Oxford Univ. Press, New York City, p. 133, 1938.
- (12) STELLA, G.: On the Mechanism of Production and the Physiological Significance of "Apneusis." *Jour. Physiol.*, **93**: 10, 1938.
- (13) PITTS, R. F., MAGOUN, H. W., AND RANSON, S. W.: (a) Localization of the Medullary Respiratory Centers in the Cat. *Am. Jour. Physiol.*, **126**: 654, 1939; (b) Interrelations of the Respiratory Centers in the Cat. *Ibid.*, **126**: 689, 1939.
- (14) BERGER, H.: Ueber das Elektrenkephalogramm des Menschen IX. *Arch. f. Psychiat.*, **102**: 538, 1934.
- (15) GIBBS, F. A. AND DAVIS, H.: Changes in the Human Electro-Encephalogram Associated with Loss of Consciousness. *Am. Jour. Physiol.*, **113**: 49, 1935.
- (16) DAVIS, P. A., DAVIS, H., AND THOMPSON, J. W.: Progressive Changes in the Human Electro-Encephalogram under Low Oxygen Tension. *Am. Jour. Physiol.*, **123**: 51, 1938.
- (17) THORNER, M., GIBBS, F. A., AND GIBBS, E. L.: The Relation Between the Electro-Encephalogram and Flying Ability. *War Med.*, **2**: 255, 1942.
- (18) *Air Service Manual*. U. S. Gov. Printing Office, Washington, 1918.
- (19) ARMSTRONG, H. G. AND HEIM, J. W.: Factors Influencing Altitude During Short Exposures to Decreased Barometric Pressures. *Jour. Aviation Med.*, **9**: 45, 1938.
- (20) SCHNEIDER, E. C.: Physiological Effects of Altitude. *Physiol. Rev.*, **1**: 631, 1921.
- (21) VERNON, H. M.: The Solubility of Air in Fats, and its Relation to Caisson Disease. *Proc. Royal Soc.*, **79**: 366, 1907.
- (22) BEHNKE, A. R., THOMPSON, R. M., AND SHAW, L. A.: The Rate of Elimination of Dissolved Nitrogen in Man in Relation to the Fat and Water Content of the Body. *Am. Jour. Physiol.*, **114**: 137, 1935.
- (23) BEHNKE, A. R. AND WILLMON, L. L.: Gaseous Nitrogen and Helium Elimination from the Body during Rest and Exercise. *Am. Jour. Physiol.*, **131**: 619, 627, 1940.
- (24) BEHNKE, A. R., THOMPSON, R. M., AND MOTLEY, E. P.: Body Equilibration with Pulmonary Nitrogen. *Am. Jour. Physiol.*, **112**: 545, 1935.
- (25) BEHNKE, A. R. AND YARBROUGH, O. D.: Physiologic Studies of Helium. *U. S. Nav. Med. Bull.*, **36**: 542, 1928.

- (26) BEHNKE, A. R.: High Atmospheric Pressures; Physiological Effects of Increased and Decreased Pressure; Application of these Findings to Clinical Medicine. *Ann. Int. Med.*, **13**: 2217, 1940.
- (27) BEHNKE, A. R. AND SHAW, L. A.: The Use of Oxygen in the Treatment of Compressed Air Illness. *U. S. Nav. Med. Bull.*, **35**: 61, 1937.
- (28) FULTON, J. F.: Physiology and High Altitude Flying. *Science*, **95**: 2461, 1942.
- (29) DILL, D. B.: Life, Heat and Altitude. Harvard Univ. Press, Cambridge, 1938.
- (30) HALDANE, J. S. AND PRIESTLEY, J. G.: Respiration. Yale Univ. Press, New Haven, 1935.
- (31) KORB, J. H.: Bends in High Altitude Flying. *U. S. Nav. Med. Bull.*, **40**: 282, 1942.

GONADOTROPINS AND GONADAL HORMONES IN THE MALE*

HERBERT SCHOENRICH, M.D.

BALTIMORE, MD.

Tremendous progress has been made in the past decade on endocrinology of the reproductive organs, so much so that today it constitutes an integral part of medical urology. David Landsborough Thompson,† in the Raymón Guiteras Lecture before the Annual Convention of the American Urologic Association said, "Endocrinology and urology may be called co-evals."

The literature relating to the various aspects of this subject is enormous, and claims and counterclaims of clinical data are increasing daily. Much of the investigation has been on experimental animals and has provided a well-supported conception of the nature, mechanism and physiology of the reproductive processes as based on endocrine research. However, while knowledge of these intricate phenomena in the animal is in some degree positive and confirmed, information of these same functions in the human is to a great extent presumptive and based largely upon assumption, hypothesis and analogy. Only rigidly controlled experiments reveal the limits of applicability of data from animals to man in view of many constitutional and cultural factors by which they are separated. With increasing knowledge the topic is growing more complex instead of being simplified.

Unfortunately, the popularity of gonadotherapy has grown faster than experimental and chemical research could possibly give evidence of the merit of such therapy. The inevitable result is that of abuse and empiricism, exaggerated claims and disappointments. The barrage of literature of commercially exploited products is overwhelming the physician with many newly coined words and condensed data of current experimental and clinical literature, all of which leave the mind rather confused and uncertain.

These remarks will be confined briefly to: First, some of the elements concerning the physiology of the anterior lobe of the pituitary gland and the testes, and the interrelationship of the two; second, the grouping and source of sex hormones; third, their clinical application, with opinions, pro and con, as gathered from recent literature.

THE ANTERIOR LOBE OF THE PITUITARY GLAND

Although the anterior lobe of the pituitary gland is known to be the storehouse of many hormones, experimental biology has virtually proved the

* Read before the Maryland Academy of Medicine and Surgery, Baltimore, December 16, 1941.

† The Raymón Guiteras Lecture, American Urologic Association Convention in Quebec, Canada, June 29, 1938.

existence of at least five separate internal secretions or hormones, viz: Somatotropic (growth), cortico-(adreno) tropic, thyrotropic, lactogenic, and gonadotropic (1). The existence and action of the other hormones of the hypophysis are not as well established as is the case with these five listed.

The gonadotropic hormones emanate from the basophilic cells and it is the accepted opinion that there are two such principles elaborated, (a) the follicular stimulating hormone—F.S.H., and (b) the luteinizing hormone—L.H. These are also referred to as Prolan A and B. Evidence as to the separate identity of these is not completely convincing to all investigators (2).

In the female, the F.S.H. provokes the growth, development and maturation of the primordial follicle into the graafian follicle; the L.H. converts the granulosa cells of the follicle into the lutein cells and causes the transformation of the ruptured follicle into a corpus luteum.

In the male, the F.S.H. stimulates germinal epithelium and induces the function of spermatogenesis; the L.H. essentially affects the interstitial cells of the testes to secrete gonadotropic material.

Evidence of the existence of pituitary hormones is based on: First, the effects of hypophysectomy, which gives rise to atrophy or involution of most of the endocrine glands, or polyglandular deficiency. These effects are remarkably uniform for all species studied. The investigations on dogs reported over thirty years ago by Cushing and his collaborators and by Ashner revealed that the gonads atrophied after hypophysectomy. Secondly, the effect of the injection of hypophysial extracts in (a) normal animals, where there is induced intense secretory stimulation, and (b) animals in which an endocrine deficiency has been established by the ablation of some of the endocrine glands, usually the hypophysis. In such instances involutionary changes can be prevented, gonads repaired, and the function of spermatogenesis continued with fresh pituitary implants, testis implants, chemical androgens, and progesterone, provided the delay has not been too great to have permitted permanent damage to set in (3). Though there is no such thing as experimental hypophysectomy in the human, pituitary pathology and the accompanying syndromes of the reproductive processes are familiar. The pituitary gland, therefore, influences and in most cases directly controls all of the other glands of internal secretion. Hence the integrity of the anterior lobe is necessary for the normal functioning of the testis. The mass of literature that has accumulated on this subject, covering the interrelationship of the pituitary gland and the generative organs, was given in a comprehensive review by Van Dyke in 1939 (4).

The testicle. It is difficult to understand completely the physiology and biochemistry of the testicle. The testes are labile organs and easily influenced by a number of different conditions.

Properly stimulated by the pituitary, the testicle performs two principal functions that make it the specific and primary organ of reproduction. The basic one is spermatogenesis, i.e., the formation of mature spermatozoa. The endocrinous function, namely, the secretion of hormones emanating from the interstitial cells induces libido and potency, and is responsible for the sex drive. It also controls the distribution of body fat and hair, and maturation of the skeleton, including closure of the larynx, thus influencing the voice and the development and maintenance of the accessory organs of reproduction in a functional state. Briefly, the hormone regulates directly the whole male sexual physiology, and indirectly the male psychology and social reaction.

The relation of these two functions is unknown, but they run closely parallel and many conditions that stimulate or depress germ cell production likewise modify hormone secretion (4). The excision of the gonads will produce involutionary changes in the accessory reproductive organs similar to those observed following hypophysectomy. Although it has been known since Biblical times that castration produces the eunuch, it was not until centuries later (1849) that Berthold proved the effect to be produced through humoral substances, as based on the well-known experiment of the castrated cock becoming a capon. The use of mammals as indicators of testes hormone has depended in the main on changes occurring in the accessory reproductive organs after castration, these organs being the principal site in the organism of morphologic responses.

Bouin and Ancel (10) demonstrated that the hormone secreting capacities occur in the absence of spermatogenic activities. In consequence, the masculinizing influence of the testicle is independent of, and secondary to, active production of the germ cell. This phenomenon is observed in cases of undescended testicle, even when bilateral, which devoid of germ cell activity, nevertheless exert typical masculinizing tendencies on normal organs, as evidenced so often by the normal size of the penis, prostate, and accessory genitalia. However, hypogenitalism usually accompanies cryptorchidism. Testis grafts devoid of spermatogenic activity may exert a masculinizing influence, as do also testes injured through irradiation. The failure of germ cell production in undescended testicles is believed to be caused by the function of a higher temperature of the abdomen. The scrotum is the thermoregulator and when exposed to higher temperature there is a degeneration of the semeniferous tubules.

Just as the pituitary hormone influences the gonads, the gonadal hormones from either sex likewise react on the pituitary gland and effectively reduce or probably limit the amount of pituitary gonad-stimulating material. The loss of testicular function, whether by castration or otherwise, causes enlargement of the pituitary gland and increased secretion of the pituitary

gonadotropins, whereas the administration of androgens and estrogens lowers the stimulating effect. Apparently the testicles are never active to the full extent of their powers, and this reciprocal interaction between the gonads and pituitary secretion appears to be a fundamental element in the regulation of the two glands, and hence of the reproductive cycle (2). There is every reason to believe, therefore, that hypogonadal conditions may represent fundamentally hypopituitary activity.

There are two points of practical importance. The testis hormone is not stored in the body but rather quickly utilized, broken down and excreted. The output has been estimated at from 40 to 60 I. U. daily. Furthermore, its production is influenced by vitamins A and E and definitely increased by ultraviolet irradiation, especially over the skin of the genital region. To be completely effective the hormone must be maintained in the body in concentrations that will affect the organ with the highest threshold of response.

THE SOURCE AND GROUPING OF HORMONES

Among the difficulties of earlier investigations was the extraction of hormones. Before 1927 testicular extracts were impure, crude, unreliable, and procured in small quantities, thus hindering greater progress in this particular field. In that year McGee (5), working in Koch's laboratory, accomplished the first successful method of extraction and concentration of the male sex hormone from the testis and thereby laid the foundation for accelerated and intensive research by biochemists throughout the world. Since then investigators have isolated androgens* showing greater potency and purity from human urine, blood, spinal fluid, and bulls' testes.

Although the reproductive tracts during development in the male and female will respond to estrogens and androgens, this need not be taken as proof that their development is dependent on such substances (22). Various terms were applied to these substances in the process of their discovery. The crude product in 1929 was called androkinin; other terms were androcin, testicular hormone, the male sex hormone, and testiculin. Prolan was applied to the gonadotropic hormone in human pregnancy urine.

* Androgen is acclaimed by its ability to stimulate the growth of the capon comb, the repair of any or all morphologic changes in the accessory reproductive organs, and the ability to restore functional activity to organs dependent upon the testis hormone. All androgenic hormones are not equally effective. Chemical substances, such as androstereone and testosterone, can:

- (a) Maintain the normal condition of the seminal vesicles and prostate in castrated animals,
- (b) Repair castration damages to adults and prepuberal castrates of long standing,
- (c) Stimulate prepuberal glands precociously,
- (d) Induce normal mating.

Estrogen refers to female hormones; it can stimulate the growth of genital tissue.

Butenandt (6), in 1934 isolated androsterone and dehydroisoandrosterone from urine in pure crystalline form. It required 24,000 liters of human male urine to extract about 15 mg. of this crystalline hormone. It was shown that these urinary androgens differed from the testicular extract.

The year 1935 is significant in connection with these endocrine studies. Ruzicka, and Ruzicka and Wettstein (7), respectively, synthesized androsterone and dehydroisoandrosterone by the chemical degradation of cholesterol. This was the turning point toward greater progress as larger supplies of the hormones were made available, likewise in greater purity, thereby advancing experimental and clinical studies. In this same year a crystalline substance of exceptional potency, testosterone, was reported as being extracted from bulls' testes (8). In order to extract from 150 to 270 mg. of testosterone one ton of bulls' testes was required (9). Later this hormone was synthesized and then esterized with propionic acid. It is familiarly known as testosterone propionate and possesses androgenic properties of relatively high potency.

The grouping of male sex hormones is set forth in table 1.

Hydatiform moles, chorionic epitheliomas and other tumors containing embryonic tissue also cause the appearance of the A.P.L. hormone in urine, in which case it may be present in an amount from one to five hundred times greater than the hormone content usually seen in pregnancy. When the tumors are removed there is a disappearance of the hormone, unless metastasis has set in (16).

Obviously, gonadotropins depend for their effect on the capacity of the testes to secrete androgens and hence are of no avail in the case of the castrate or of the person whose testes are not responsive (12, 13).

The urine of both men and women contains both male and female hormones and it is the deviation from the normal ratio of these two hormones that gives expression to basic changes in the individual. Thus, it is held that the normal predominance of the respective hormone in each sex determines the characteristic orientations peculiar to the types of the ideal male and female in both the physiologic and psychic spheres. Accordingly, a reversal of the hormone balance means opposite sex characteristics. Wide variance from the normal is, theoretically at least, the underlying factor of homosexuality.

There is a close relationship, chemically and therapeutically, of these various hormones, and no clearcut distinction has been made for the clinical use of many androgens and estrogens (17). Both are prepared synthetically from cholesterol. Their respective efficacy, therefore, is difficult to evaluate and the choosing of a preparation for practical purposes still remains largely speculative and problematic.

Inasmuch as greater progress has been made in gynecologic endocrinop-

TABLE 1
Gonadotropins

1. *Anterior pituitary hormone.* Possesses two factors, namely, follicular stimulation, i.e., reported to stimulate only the tubular elements of the testes, and the lutein factor, which influences the growth and functional activity of the interstitial cells as indicated by the growth and development of accessory glands. This hormone is not identical with the chorionic hormone (1). As a gonadotropic agent in male urology it is no longer regarded as being of much practical value, whereas in gynecologic practice it possesses a wider field of applicability. According to Freed, the biologic effectiveness of this hormone has been proved on animals, but the commercially available preparations are relatively crude in comparison with those developed experimentally (19).

2. *Hormone from the blood and urine of normal men and women,* and from women undergoing the menopause, whether artificial or natural. This hormone is probably pituitary in origin and differs from the chorionic gonadotropin excreted by pregnant women. It is said to be follicular stimulating and in large quantities also luteinizing. This hormone is not exploited commercially.

3. *Chorionic (luteinizing) hormone.* Is found in body fluids and tissues in the presence of living chorionic tissue, or when pathologic chorionic tissue is present. The source is the blood and urine of pregnant women and mares; it is likewise demonstrated in the placenta. It is the first hormone to be used clinically and is often referred to as the anterior pituitary-like, A.P.L., hormone. To some investigators this is an erroneous application of the term inasmuch as it is not altogether similar to the anterior pituitary substance. This hormone stimulates the testes tissue to formation of testicular androgen, whereby secondary sex characters are intensified and genitalia enlarged. It influences genital growth, especially before puberty, and is of popular clinical usage in cases of cryptorchidism, where it has effectively caused testicular descent, provided, of course, no anatomic barrier existed. It also favors physical inertia and psychic maturity. Gonadotropins from human pregnancy urine were discovered by Aschheim and Zondek and afford the bases of the pregnancy test (3).

4. *Equine hormone.* Is obtained from the serum of pregnant mares. Very little, if any, is found in the urine. It is probably chorionic in origin. The physiologic response is said to be "a blend of those produced by the gonadotropic principle of human pregnancy urine (3)"; likewise, "to combine, in correct proportion, the F.S.H. and L.H. (19)." Its effect is through the pituitary gland. Equine hormone is said to stimulate spermatogenesis but is of wider usage in gynecology.

GONADAL HORMONE

5. *Testes extract (testosterone).* Possesses relatively the strongest androgenic properties. This hormone has little effect on the testicle itself but a most decided effect on other genital structures and the development of masculine traits. Clinically it is perhaps the most effective hormone and frequently is used in endocrine urology, where it is administered essentially for replacement purposes.

athies, the market has been flooded with a score or more of estrogenic products. The commercial preparations having had wide usage in gonadotherapy in the male are included in table 2.

Since endocrinologists have little knowledge of the amount of gonado-

tropic hormone produced by the anterior lobe of the pituitary gland or the testicle during health, they cannot tell how much is required for replacement therapy in deficiencies. The question of dosages and the standardization of preparations are based largely on established criteria of biologic response.

The rat unit of estrogenic substances is the minimum amount which, given twice a day for three consecutive days, will produce mature follicles, hemorrhagic follicles, and corpora lutea in the ovaries of immature rats. The mouse unit, international unit, is equal to one-fifth of a rat unit. The Council of Pharmacy and Chemistry of the American Medical Association recommends the I.U. in expressing the potency of Council Approved preparations (17).

The biologic tests for ascertaining the hormone potency of androgens are measured by comb growth in the fowl, increase in weight of the seminal vesicles and prostate in rodents, and growth in the bill of sparrows. There

TABLE 2

<i>Hormone of the anterior pituitary gland</i>	<i>Equine</i>
Gonadotropic factor	Gonadogen
Antuitrin	Anteron
Gynantrin	Gonadin
Prephyson	
<i>Chorionic Hormone (A.P.L.)</i>	<i>Testosterone Propionate</i>
Antuitrin S	Oreton
A.P.L.	Neo-Hombreol
Follutein	Metandren
Koratron	Perandren
Pranturon	Androstine A & B

is as yet no universally accepted standard. It varies because of many factors, some uncontrollable, namely: The age, health and species of the tested animal; seasonable influences and environmental factors; the variation, in test animals, of their individual responses to drug and glandular treatment; variation of technic and lack of uniformity in determining the end point of activity as observed in comb growth, vaginal smears, and other indications (30). Finally, the purity of the respective glandular product also plays a rôle.

The quantitative aspect of dosages will be omitted here inasmuch as every case must be regarded as an individual problem.

The methods of administration of testosterone products are intramuscular, inunction, peroral, tablet implantation, and sublingual absorption. The original injection method of male hormone administration was found successful and continues to be an efficient means of supplementing hormone deficiency. The principle in substitution therapy is to get the maximum

effect over a prolonged period. Simplicity of medication is obviously the ideal, hence the advantage of the oral method. The optimal maintenance peroral dose of methyl testosterone is from three to five times that of parenteral means; the expense, therefore, is an item. Foss (21) has shown that unless a relatively great amount of the commercially available ointment (greaseless base) is used, the physiologic effect is insignificant.

CLINICAL APPLICATION

As in other physical states, the goal of therapy in gonad dysfunction is to reproduce a normal condition in an abnormal body. The endocrinopathies of the reproductive system where hormone therapy has been given wide application include: hypogonadism, hypogenitalism, eunuchoidism, infantilism, cryptorchidism, adiposogenital dystrophy (Fröhlich's syndrome), and gynecomastia. The syndromes, of course, are largely correlated and may, more or less, accompany one another, depending to a great extent upon the character and degree of secretory deficiency, the age of the patient, and the time of onset. Other conditions where hormone imbalance is said to be a factor are prostatic hypertrophy, senescence, sterility, and impotency.

If it can be determined that pituitary deficiency is the underlying etiology, as in infantilism, Fröhlich's syndrome, and hypogonadism secondary to pituitary deficiency, the gonadotropin of the anterior lobe of the pituitary gland would appear to be the hormone of choice, together with other appropriate therapy.

Hypogonadism denotes the deficiency of the functional activity of the testicle. Such deficiencies occur in various degrees and may appear as eunuchoidism of preadolescent origin, mild sexual retardation (delayed puberty) as the result of surgical or traumatic injuries, castration, or hypogonadism of undetermined origin.

Such patients have been excellent subjects for study of both the phenomenon of testicular insufficiency and the effects produced by androgens, and it is here that the efficacy of testosterone propionate has been firmly established as replacement therapy to compensate for either the absence of or inadequate testicular secretion.

The clinical aspect of prepuberal deficiency is that characterized by the eunuchoid state and hypogenitalism, namely, small genitalia, skeletal disproportion, high pitched voice, body hair deficiency, and other physiologic and psychic changes differing in degree. In postpuberal deficiencies the secondary sexual and masculine characters show definite regression, but inasmuch as anatomic development has already been established the changes are obviously not to the degree of the prepuberal state (11).

Foss (14), Hamilton (18), Webster (32), Vest and Howard (30), McCul-

lagh and McGurl (31), Turner (34, 35), and others have reported dramatic results in various types of hypogonad individuals under their careful observation. These writers gave a rather detailed account of their cases and set forth the prompt responsiveness to therapy, both subjectively and objectively. In many instances the progressive improvement was corroborated by photographic illustrations. Benefit was observed even in persons castrated for more than two decades, or in those whose eunuchoid state had persisted until the middle years of life. In the prepuberal age profound anatomic changes were observed in the proportional growth of genitals, priapism, pubic and body hair growth, increased body weight, deepening of the voice, and similar changes. In postpuberal cases there was restoration of libido, ejaculation, masturbation, hair growth, and the return of masculinizing tendencies. The differentiation with certainty between boys with delayed maturation and those who will never mature properly is a problem in itself, inasmuch as the limitation and dangers of hormone therapy must be recognized. Hamilton (11), in a survey on this point, gives as his opinion: "... the facts now available suggest that there is little gain and that there may be harm in the early administration of gonadotropins and androgenic preparations to boys with delayed maturation."

The discontinuance of testosterone therapy, after having proved effective in hypogonadism, will result in a regression of the syndromes to which the case originally gave expression. A maintenance dose, therefore, must be kept up indefinitely and this makes the treatment a troublesome and expensive procedure. Regression of symptoms does not appear so often in prepuberal adiposogenital types in which adolescence seems to progress normally.

The gonadotropins have not been as effective in the treatment of hypogonadism, except in selected cases where genital growth is essentially the aim. Many of the cases reported that have responded so favorably under testosterone propionate had been treated previously with anterior pituitary and A.P.L. hormones with little or no effect.

Cryptorchidism. Highly satisfactory results have been reported in cryptorchidism where the A.P.L. hormone has been credited with overcoming 60 per cent of the cases treated, as gathered from a summary of 320 cases by twenty-three authors (35). Likewise, the chances for a good surgical result are enhanced when this procedure is indicated. Individual reports with considerable variance in results include those of Thompson and Heckel (28) who had favorable results in but 17 per cent of sixty instances. These authors discussed the limitations of gonadotropins in cryptorchidism and advised that this therapy should be watched carefully to avoid producing genitalia larger than normal for the age. They intimated that a critical study had shown that about one of every five patients with retained testes

responded to treatment. At any rate, great care is imperative in the selection of patients and in determining whether or not anatomic factors are the primary causes of testicular arrest.

Testosterone propionate is not effective in cryptorchidism according to Hamilton (18) and Sexton (36), who advised against its use, nor where increased testicular development is the only objective. These investigators, however, recommended this hormone in the subgenital development of the prepuberal state, and where administration of the A.P.L. hormone has failed and eunuchoidism prevails. There are certain types of hypogonad-cryptorchid individuals in whom the two syndromes may be so closely associated that the preference of either A.P.L. or testosterone remains largely speculative.

At what age should hormone therapy be instituted in the undescended testicle? Here again is found a variance of opinion. Zelson (37) and others have advocated its use at an age as early as two and one-half years, their intentions being to avoid skeletal disproportion and among other things the all important problem of psychic difficulties. However, wise discretion in the administration of androgenic therapy before puberty is imperative since it may influence hypophysial suppression which, in turn, may encourage precocious genital development, premature closure of the epiphysis, and may be a detriment to spermatogenesis (11, 12). The preponderance of opinion is that better results are seen when therapy is given at puberty while the adolescent awakening is at its height.

Prostatic hyperplasia (benign hypertrophy of the prostate). Of the many theories proposed relative to the etiology of prostatic hypertrophy, this subject still remains obscure. Lately there has been a growing conviction that it is inseparately bound up with endocrine changes affecting the pituitary gland and the gonads. This is not altogether a new idea. Methods of treatment were employed empirically many years ago, because of the observation that eunuchs and postoperative castrates were not affected with prostatic enlargement.

The wide interest in this particular phase of the topic is testified by the voluminous publications covering numerous theories and experimental and clinical investigations that have appeared in recent medical literature. One theory often quoted is that of Lower and McCullagh (29) who believe that benign hypertrophy is caused by overstimulation of the testes by the pituitary gland, and that hyperactivity of this gland results from the lack of water-soluble hormone of the testicle. It is their impression that in the testicle two hormones appear during the florid years of every male and under normal conditions these two work synergetically. In senescence, the water-soluble hormone called inhibin or contruin slowly diminishes and causes hyperactivity of the pituitary gland. The authors therefore con-

cluded that such enlargement and hyperactivity of the pituitary gland may be prevented by hormone emanating from testicular tissue.

Laqueur and his associates (27) and others subscribed to the theory that hormone imbalance of the estrogen-androgen ratio, mainly the diminution of the male hormone, causes prostatic hypertrophy. It has been demonstrated repeatedly that patients with prostatic hypertrophy show a reduction of androgen secretion.* During the advancing age of man there is also a corresponding decrease of urinary androgen. Animal experimentation has revealed that the administration or feeding of estrone, thereby altering the balance of the two hormones, brought changes similar to those occurring in prostatic hypertrophy in man. These changes could be retarded by the simultaneous administration of gonadotropic substance. The inference, according to these observers, points to the use of male androgens as the logical therapy.

Hamilton, according to Meltzer (33), believes that relief of the subjective symptoms results from increased muscle tonus of the detrusor bladder musculature. He also reports increased tonus of the muscles of the iris, the intestines, the heart, and of the skeletal muscles.

Of the encouraging clinical results, six leading authors in reporting 299 cases revealed that 55 per cent showed perceptible improvement with hormone therapy in certain types of cases, namely, grades one and two, benign, soft, large, adenomatous and spongy prostates. Patients with fibrotic medium bar formation or mechanical occlusion of the bladder neck by large intruding middle lobes, and those with urinary retention from long-standing, insidious prostatic disease, can hardly expect relief of their symptoms from hormone injection. The improvements reported were reflected in the alleviation of subjective symptoms, viz., urinary frequency, the small stream, dysuria, nocturia, and tenesmus, all of which tend to break down the general health of older men. Such distressing symptoms, it is claimed, partly or entirely disappeared; moreover, the patients showed decided mental and physical improvement and relief from fatigue and general discomfort. For its general salubrious and tonic effect on the system, testosterone propionate has been advised before and after prostatectomy and recommended especially in those patients who are poor surgical risks.

Although patients have been relieved of their subjective symptoms, no change in size of the prostate has been observed at any time, nor diminution of residual following hormone therapy. The absence of any significant effect on the histologic structure of benign hypertrophied prostates following hormone therapy was shown recently by Moore and McLellan (38) who treated one group of patients with androgen and another group with estro-

* McCahey, Hansen, and Soloway made a careful quantitative study by the cockscomb method and found normal amounts of hormone in prostatics. *Jour. Urol.*, **38**: 397, 1937.

gen injections over a period of time preceding prostatectomy. Histologic examination of the glands subsequently revealed little, if any, change from the usual microscopic picture of a hypertrophied prostate. Similar observations are borne out by the studies of Heckel (15), by Sharpley-Shafer, Shrire, and Sheckman (20), and by others (33). In a recent report Moore and his collaborators (39) maintained that "their investigations lend no support that benign hypertrophy of the prostate is caused by an excess of either hormone." Other investigators have subjected patients with early benign hypertrophy to prolonged female hormone injection without observing an augmentation of the symptoms. Draper, Slaughter, and Denslow (26), in reporting a series of cases saw no improvement in the urinary status from the use of testosterone propionate which could not be duplicated with sterile water. After reviewing the many theories and experimental data on the subject they wrote "that it would seem unreasonable to expect benefit from the administration of exogenous androgenic substances." That in early prostatic hypertrophy patients may enjoy remission without therapy was brought out by Clarke who reported this fact in a series of cases provided by a control group of sixty-seven patients. Forty-seven of these showed spontaneous improvement. Heckel (15) failed to obtain relief in his cases from the use of male hormone therapy.

It is evident, therefore, that opinions today in respect to hormone therapy in prostatism are conflicting and inconclusive. The earlier enthusiastic clinical reports are not being substantiated adequately in later publications. Nevertheless, there is general optimism that more fruitful and positive developments will inevitably emerge after continued investigation and research.

Sex impotency and senescence. The sex urge is instinctive and the quest of man for sex rejuvenation dates back to ancient times. Medication of wide description, plants, witchcraft, rituals, symbols, dejecta, anatomic remedies, perfumery, proxies, and appeals to the deity are barely an indication of the many approaches to the treatment of impotency.

The connection between hormonal secretion and impotentia therapy dates back to the first century A.D., when the ingestion of gonads was recommended as an aphrodisiac by Mesuë. Since then, for many centuries the testes of various animals have been prescribed as aphrodisiacs.

Brown-Séquard in 1889, at the age of seventy-one, injected crushed testicular substances into his system and experienced a tremendous revitalization in his organs, sexual power, and mental activities. He and others associated fatigue and decreased vitality of advancing age with the decrease in sex vigor and described a condition in some males as the climacteric. In 1920 Steinach of Vienna reported his famous experiments with vasoligation and vasectomy in animals and humans. His operations resulted in many changes, among which were renewed sexual vigor and potency, the

disappearance of wrinkles from the face, and increased mental and physical power. He attributed these phenomena to an increase in interstitial tissue of the testes which secrete hormonal substance. A few years later Voronoff in Paris reported sensational results after transplanting testes of monkeys and claimed resultant temporary rejuvenating effects. Roentgen rays have also been applied to the ovaries and testicles in doses sufficient to destroy the parenchyma and thus increase the interstitial tissue. The ultimate goal of all methods was ostensibly toward the production of sex hormones. While favorable responses may have occurred, it is the consensus of expert opinion that the psychic element played a major rôle. At any rate, there is not adequate scientific evidence or corroborative clinical data to substantiate satisfactorily the efficacy of any of these methods.

In man, libido and potentia are highly complex functions, with psychologic, neurologic and hormonal factors closely integrated. Just what rôle is played by sex hormones is not yet well understood. There are reports of favorable clinical responses following the administration of hormone preparations, but there is need for considerable caution in interpreting subjective improvement of libido and potentia as proofs of hormone therapy. It should be remembered that sex impotency is essentially a symptom of an underlying etiology with the psychic element a dominant factor, especially in the younger man. There is no reason to suspect that an otherwise normal man, who during his reproductive years finds himself suddenly impotent, lacks anything but the proper set of ideas rather than any particular endocrine. The influence of the mind over sex power is amazing and some of the most fantastic stories are heard in this regard. Definite improvement of libido has been seen in men after such measures as prostatic massage, the passage of a sound or dilator, topical applications of the posterior urethra, diathermy, and aphrodisiacs. Although local disturbances may have been the underlying cause, perhaps the mind was influenced and in reality effected the result. Unless convincing evidence is established that an actual deficiency of hormone is primarily responsible for the patient's syndrome, hormone therapy is not only ill advised and scientifically incorrect but may suppress the activity of the gonad, and in sufficient doses testosterone may cause the disappearance of spermatozoa from the seminal secretion.

Unfortunately, there is no simplified technic to determine the amount of hormone in the body that would provide a more rational and scientific basis for therapy. What furthermore complicates these studies is that disturbances in other endocrine organs, notably the thyroid, the pancreas and the adrenals, may alter the proper qualitative and quantitative balance of the pituitary gland and the gonads essential for normal function, and here knowledge is meagre and obscure.

Lately much has been heard about the male climacteric and its endocrine

relationship on the premise that since the male sex hormone is responsible for the development in the boy of the secondary sex characteristics, in the declining years there is a reversal to a state similar to that of childhood because of the lessening of testicular secretion, with the Leydig cells reduced to a minimum in the senile atrophied testicle. This change is normally so gradual that the individual has plenty of time to become resigned thereto without too serious mental and physical derangement.

The symptom complex has briefly been described by various writers as: Intermittent feeling of fatigue, irritability, depression, insomnia, weakness and other emotional and neurocirculatory disturbances, diminished sexual powers, gradual atrophy of the genitalia, prostatic hypertrophy with its accompanying urinary disturbances, marked changes seen in the skin, hair, weight, skeletal muscles, voice, distribution of fat, and psychic changes. There have been rather elaborate descriptions of this syndrome by several investigators (23, 24, 25) and apparently they have not omitted mentioning a single human symptom. If any of these ills is a true indication of the condition described, it is then safe to say that every man has the menopause. What are the facts? The author feels that the average physician's judgment and interpretation of this question is equal to that of the urologist. Recently Freed (19) described the male climacteric as "a relatively rare condition."

There is every reason and evidence to believe, however, that testosterone propionate is frequently of definite value in men past fifty, particularly when the symptoms are pronounced. In these patients the administration of male testis hormone seems to be the logical therapy because of its stimulating and replacement properties. The author has personally followed a series of such cases, with gratifying results in a number of instances. The effect is usually characterized by general physical and psychic improvement, increased bodily vigor, mental concentration, relief in urinary disturbances, and occasionally a satisfactory restoration in libido and potentia. However, the ability to obtain erections depends on more than the mere presence in the body of androgens (11). The young and middle-aged castrate and the hypogonad who are so strikingly benefited by hormone therapy cannot be compared with men insidiously undergoing the physiologic involutionary changes of advancing years. Such men treated with testosterone, either for the syndrome of senescence, impotency or benign prostatic hypertrophy, may have experienced an augmentation of erection but often sadly found it inadequately adapted for coitus. Physiologic senescence cannot be altered appreciably. Few people have the divine quality of growing old gracefully and being able to grasp seriously the cold truth that sensual thrills must inevitably cease. The problem of rejuvenation will, therefore, be present for all time.

With respect to sterility in man, hormone therapy holds little promise at the present time. There are several reported instances found in the literature where the sperm count was apparently increased where it had been low, but results were not successful in the re-establishment of spermatogenesis by endocrine therapy in cases of azoospermia (40). Although the re-establishment of spermatogenesis in the experimental hypophysectomized animal, following the injection of follicle stimulating hormone, has been encouraging, the results of endocrine therapy in the male have been extremely unsatisfactory and discouraging. If no organic lesion is found or suspected it can be assumed, provided there are definite clinical stigmas of endocrine dysfunction, that the deficient spermatogenesis is endocrinic in origin. In such instances the injection of follicular hormone, that which stimulates the seminiferous tubules, and luteinizing hormone (equine) may be used in an attempt to excite spermatogenesis. Testosterone propionate, however, is contraindicated since it may cause a temporary depletion of spermatozoa in patients who have normal counts; in others, ologospermia may be produced (15).

In conclusion, it may be stated briefly that hormone therapy in male urology, like other problems in endocrinology, is not yet definitely established but is still to be regarded in the experimental stage.

Certain types of hypogonadism have responded promptly and satisfactorily under testosterone propionate medication. Although the clinical use of this hormone is relatively new and further experience is necessary to evaluate its efficacy, the brilliant achievements in the laboratory seem to justify some of the optimism indicated in the literature on this subject.

BIBLIOGRAPHY

- (1) SMITH, P. E.: Relationship of the Anterior Lobe of the Hypophysis to other Endocrine Glands. *Jour. Am. Med. Assn.*, **115**: 1991, 1940.
- (2) ENGLE, E. T. AND LEVIN, L.: Gonadotropins of the Anterior Lobe of the Pituitary and of Chorionic Tissue. *Jour. Am. Med. Assn.*, **116**: 47, 1941.
- (3) MOORE, C. R.: Physiology of the Testis. *Jour. Am. Med. Assn.*, **116**: 1638, 1941.
- (4) VAN DYKE, H. B.: The Physiology and Pharmacology of the Pituitary Body. University of Chicago Press, Chicago, **1**: 1936; **2**: 1939.
- (5) MCGEE, L. C.: The Effect of the Injection of a Lipoid Fraction of Bull Testicle in Capons. *Proc. Inst. Med. Chicago*, **6**: 242, 1927.
- (6) BUTENANDT, A. AND DANNENBAUM, H.: Ueber Androsteron: III Isolierung eines neuen physiologisch unwirksamen Sterin-derivates aus Männerharn seine Verknüpfung mit Dehydro-androsteron und Androsteron: ein Beitrag zur Konstitution des Androsterons. *Ztschr. f. physiol. Chem.*, **229**: 192, 1934.
- (7) RUZICKA, L. AND WETTSTEIN, A.: Ueber die künstliche Herstellung des Testikelhormons, Testosteron (Androsten-3-on-17-ol), *Helvet. chim. acta*, **18**: 1264, 1935.
- (8) DAVID, K., DINGEMANSE, E., FREUD, J., AND LAQUEUR, E.: Ueber krystallinisches männliches Hormon aus Hoden (Testosteron) wirksamer als aus Harn oder aus Cholesterin bereitetes Androsteron. *Ztschr. f. physiol. Chem.*, **233**: 281, 1935.

- (9) DAY, R. V.: Male Sex Hormone Therapy, *Jour. Urol.*, **41**: 210, 1939.
- (10) BOUIN, P. AND ANCEL, P.: Recherches sur les cellules interstitielles du testicule des mammifères. *Arch. de. Zool. Expér.*, **1**: 437, 1903.
- (11) HAMILTON, J. B. (New Haven, Conn.): Therapeutics of Testicular Dysfunction. *Jour. Am. Med. Assn.*, **116**: 1903, 1941.
- (12) HAMILTON, J. B. (New Haven, Conn.): Treatment of Sexual Underdevelopment with Synthetic Male Hormone Substance. *Endocrinology*, **21**: 649, 1937.
- (13) EIDELSBURG, J. AND ORNSTEIN, E. A.: Observations on the Continued Use of Male Sex Hormone over Long Periods of Time. *Endocrinology*, **26**: 46, 1940.
- (14) FOSS, G. L.: Effect of Testosterone Propionate on Postpuberal Eunuch. *Lancet*, **2**: 1307, 1937.
- (15) HECKEL, N. J.: The Influence of Testosterone-Propionate upon Benign Prostatic Hypertrophy and Spermatogenesis: A Clinical and Pathological Study in the Human. *Jour. Urol.*, **43**: 268, 1940.
- (16) FERGUSON, R. S.: Quantitative Behavior of Prolan A in Teratoma Testis. *Am. Jour. Cancer*, **18**: 269, 1933.
- (17) GUSTAVSON, R. G. AND D'AMOUR, F. E.: The Assay of Gonadotropins and of Gonadal Hormones. *Jour. Am. Med. Assn.*, **117**: 188, 1941.
- (18) HAMILTON, J. B. (New Haven, Conn.) AND HUBERT, G.: Effect of Synthetic Male Hormone Substance on Descent of Testicles in Human Cryptorchidism. *Proc. Soc. Exper. Biol. and Med.*, **39**: 4, 1938.
- (19) FREED, S. C.: Present Status of Commercial Endocrine Preparations. *Jour. Am. Med. Assn.*, **117**: 1175, 1941.
- (20) SHARPLEY-SHAFFER, E. P., SCHRIRE, I., AND SHACKMAN, R.: Testosterone Propionate; its Effect on Histology of Prostatic Enlargement in Man. *Lancet*, **1**: 1254, 1939.
- (21) FOSS, G. L.: Percutaneous Absorption of Male Hormone: Its Practical Application to Human Therapy. *Lancet*, **2**: 1284, 1938.
- (22) MOORE, C. R.: The Influence of Hormones on the Development of the Reproductive System. *Jour. Urol.*, **45**: 869, 1941.
- (23) DOUGLAS, R. J.: Male Climacteric: Its Diagnosis and Treatment. *Jour. Urol.*, **45**: 404, 1941.
- (24) DUNN, C. W.: Male Hormone Therapy of Male Climacteric and Gonadal Insufficiency State. *Delaware State Med. Jour.*, **11**: 76, 1939.
- (25) WERNER, A. A.: The Male Climacteric. *Jour. Am. Med. Assn.*, **112**: 1441, 1939.
- (26) DRAPER, J. W., SLAUGHTER, G., AND DENSLOW, C.: Effect of Testosterone Propionate on Benign Prostatic Hypertrophy. *Jour. Urol.*, **45**: 539, 1941.
- (27) LAQUER, R.: Behandlung der Prastatohypertropie mit Mannlichen Hormon (Hombreol). *Schweiz. med. Wchnschr.*, **64**: 1116, 1934.
- (28) THOMPSON, W. O. AND HECKEL, N. J.: Undescended Testes; Present Status of Glandular Treatment. *Jour. Am. Med. Assn.*, **112**: 397, 1939.
- (29) LOWER, W. E., ENGEL, W. J., AND McCULLAGH, D. R.: A Summary of an Experimental Research on the Control of Benign Prostatic Hypertrophy and a Preliminary Clinical Report. *Jour. Urol.*, **34**: 670, 1935.
- (30) VEST, S. A. AND HOWARD, J. E.: Clinical Experiments with the Use of Male Sex Hormones; Use of Testosterone Propionate in Hypogonadism. *Jour. Urol.*, **40**: 154, 1938.
- (31) McCULLAGH, E. P. AND MCGURL, F. J.: Further Observations on the Clinical Use of Testosterone Propionate. *Jour. Urol.*, **42**: 1265, 1939.
- (32) WEBSTER, B.: The Treatment of Hypogonadism in the Adolescent Male. *Jour. Pediatrics*, **13**: 847, 1938.

- (33) HAMILTON, J. B. quoted by MELTZER, M.: Male Hormone Therapy of Prostatic Hypertrophy. *Journal-Lancet*, **59**: 279, 1939.
- (34) TURNER, H. H. (Oklahoma City): The Clinical Use of Synthetic Male Sex Hormone. *Endocrinology*, **24**: 763, 1939.
- (35) TURNER, H. H. (Oklahoma City): The Clinical Use of Male Sex Hormone; Further Report. *South. Med. Jour.*, **33**: 818, 1940.
- (36) SEXTON, D. L.: Choice of Hormone Treatment in Male Subgenital Development. *South. Med. Jour.*, **33**: 823, 1940.
- (37) ZELSON, C.: Treatment of Cryptorchidism with Gonadotropic Substances. *Jour. Pediatrics*, **14**: 452, 1939.
- (38) MOORE, R. A. AND MCLELLAN, A. M.: A Histological Study of the Effect of the Sex Hormones on the Human Prostate. *Jour. Urol.*, **40**: 641, 1938.
- (39) MOORE, R. A., MILLER, M. L., AND MCLELLAN, A.: Chemical Composition of Prostatic Secretion in Relation to Benign Hypertrophy of the Prostate. *Jour. Urol.*, **46**: 132, 1941.
- (40) THOMAS, E. P.: Sterility from Viewpoint of Endocrinologist. *South. Med. Jour.*, **33**: 744, 1940.

PROLONGED LABOR*†

ROBERT F. LINN, M.D. AND LOUIS H. DOUGLASS, M.D.

BALTIMORE, MD.

The designation, prolonged labor, is an arbitrary one and each clinic has its own criterion, the average being labor which lasts more than twenty-four hours in either a primigravida or a multigravida. In establishing this time limit the onset of fairly regular and hard pains should constitute the beginning of labor, and the weak and irregular contractions which do not interfere with the patient's rest or activities should be disregarded.

The causative factors may be divided into those resulting from abnormalities of the uterus, the cervix, the birth canal, and the fetus. It is rare that the etiology of any specific case of prolonged labor can be placed definitely in a single one of the above groups, but usually a combination of several or at times even all of the factors mentioned may be involved.

Insofar as the uterus is concerned, inertia is probably one of the most common causes of prolonged labor and many writers divide this into a primary and a secondary type. Primary inertia in itself is rare, most of the cases being secondary to poor muscular development, a systemic wasting disease, overdistention of the uterus as a result of multiple pregnancy or hydramnios, uterine neoplasm, faulty innervation of the uterus, or an endocrine disturbance. Secondary inertia presents a different picture. Here contractions begin and continue normally and rhythmically and an uneventful termination of labor may be expected. However, after a lapse of hours the pains become more infrequent and less intense, and may even stop altogether. The uterus becomes relaxed and the fetus frequently is easily palpable. There may be some disproportion or other reason for this fatigue of the uterine musculature following prolonged labor and here, of course, the inertia is the result rather than the cause.

For many years cases of prolonged labor have been attributed to cervical dystocia. Although it is true that many of these were erroneously classified, there still remains a small but definite group in which prolonged labor is caused by the failure of proper dilatation of the cervix even in the presence of satisfactory contractions. The most common reasons for this are: con-

* From the Department of Obstetrics, School of Medicine, University of Maryland.

† Read before the Obstetric and Gynecologic Section of the Medical and Chirurgical Faculty, April 17, 1942.

genital anomalies, severe scarring as the result of previous difficult deliveries or gynecologic operations, long-standing infection with an increase in connective tissue, and malposition of the cervix. There is another small group where no definite reason can be found for the failure of the cervix to dilate. It is normally situated, there is no scarring or other evidence of infection, effacement has been satisfactory, and the head is well against it. When the finger is inserted in the external os a definite sense of resistance is experienced. Frequently, but not always, this condition is found in the elderly primigravida.

As previously stated, most of the etiologic factors of prolonged labor are not present singly and one must be extremely careful to consider them all in each case before any radical procedure is instituted for the immediate delivery of the patient.

Congenital anomalies, tumors of the birth canal, and pelvic abnormalities will not be considered here, as good prenatal care should reveal most of these prior to the onset of labor.

The relationship of the presenting part to the pelvis is a frequent cause of prolonged labor. It is generally agreed that labor in the posterior and transverse occiput presentations often is prolonged. This is also true of the brow, face and breech presentations. Furthermore, variations in the fetal axis descent may play an important rôle in the length of labor with a fetus and pelvis of normal size.

The transverse and posterior occiput presentations were the most common causes in the series of prolonged labors at the University Hospital for the year 1941. These cases are difficult to handle for after a time the patient becomes anxious and tends to be uncooperative, the family becomes impatient, and the temptation to interfere too early is great. Contractions are weak and somewhat irregular, the cervix dilates poorly, and the descent of the head is slow. Many women have been made obstetric cripples and chronic invalids because the attendant yielded to the pleadings of the patient and performed difficult and unindicated deliveries.

During the year 1941 there were eighty-seven cases of prolonged labor in 1427 deliveries in the clinic at the University of Maryland. Of these, six were caused by uterine inertia, one by cervical dystocia alone, and one by overdistention of the uterus as the result of a triplet pregnancy. There were twenty-four occiput posterior, twenty-one occiput transverse, one brow, and six breech presentations. In thirty-four cases no definite cause could be found, although it was necessary to incise the cervix in six of them to complete the delivery. Without the breech presentations and the case of triplets, in the remaining eighty there were one high forceps, eleven mid-forceps, fifty-five low forceps and nine spontaneous deliveries, and fifteen hysterostomatomies were done. Two of the mothers died, one death re-

sulting from intracranial hemorrhage and the other from rheumatic heart disease. There were seven stillbirths, two of which were not the result of the prolonged labor. In addition, there were five neonatal deaths, one baby dying of bronchopneumonia nine days after birth. This gives a corrected total fetal mortality of nine, with no maternal deaths attributable to obstetric causes.

The length of labor is of no consequence as long as the condition of both the mother and infant remains satisfactory, and at no time should operative interference be contemplated while these conditions prevail. However, if the patient becomes tired and her pulse rate is rapid, a great deal often can be accomplished by giving an adequate dose of morphine and intravenous fluids. Usually after several hours of rest good contractions will begin and the subsequent progress will be satisfactory. It has been suggested that intravenous calcium is of aid in cases of primary inertia. The results in the hands of some men appear to be quite good but they have not been found entirely satisfactory at the Obstetrics Clinic. The use of intravenous calcium is not entirely without danger, for on rare occasions a sudden cardiac arrest may result. Recently it has been suggested that the uterus may be sensitized by the use of large doses of stilbestrol, and although the number of cases so treated has been small, the favorable results warrant further investigation. The use of extremely small doses of pituitary extract may be of great value in the cases of primary inertia, but it must be used judiciously. It is usually contraindicated in secondary inertia because here the muscle is fatigued. As a rule, further stimulation is unwise and invites rupture of the lower segment.

The proper use of analgesic agents has been of great benefit and, contrary to the belief of many, it has been shown in the clinic of the University of Maryland that the routine use of paraldehyde has shortened rather than increased the average duration of labor. It is of particular value in the highly emotional individual who does not tolerate pain well and refuses to bear down during the second stage. With paraldehyde these inhibitions cease and the patient uses her voluntary muscles to great advantage.

Should labor be prolonged on account of a contraction ring or clonic spasm of the uterus, morphine with, possibly, adrenalin and even deep ether anesthesia are of value. The uterine spasm should be completely relaxed before any attempt at delivery is made.

When the cervix fails to dilate properly great care must be taken to support and sedate the mother as the uterus is contracting well and secondary inertia is likely to develop. After careful observation and treatment, delivery should be accomplished provided no further dilatation occurs. If the head is well in the pelvis and the canal is completely obliterated, with only a thin external os remaining, incision of the cervix and a forceps delivery

is the procedure of choice. This is relatively easy and the results are decidedly gratifying.

The prolongation of labor because of a faulty position of the presenting part is best treated with time and support. Frequently, if delivery becomes necessary it will be found that the cervix has not dilated completely. Here again Dührssen's incisions should be used, together with forceps delivery. However, it is not unusual with proper treatment for the labor to terminate spontaneously.

CONCLUSION

From the foregoing brief comments on some of the causes of prolonged labor and its treatment, it is concluded that the conservative conduct with adequate supportive measures is in most instances the method of choice, provided one bears in mind that watchful waiting must be differentiated from hopeful procrastination.

THE HISTORY OF THE MEDICAL EXAMINER SYSTEM*†

HOWARD J. MALDEIS, M.D.

BALTIMORE, MD.

The early manner of handling crime was crude and varied considerably toward the beginning of civilization, but as time passed marked improvements were made that have resulted in more exact methods of dispensing justice. The book of books, The Holy Bible, records murder in Genesis, and the type of punishment meted out is given clearly. Its second and third books, Exodus and Leviticus, disclose numerous laws, which if broken led in some instances to the death penalty. These early crimes show that infractions of the law took place in many ways and the punishment was either by custom or law. It was enforced only too often for minor infringement. So-called justice thereby frequently miscarried.

As social standards gradually improved it was natural that better means of handling crime should be sought and progressive strides made toward solving it. There has been real progress in decreasing the atrocious and barbarous varieties of punishment. Brute force and poisoning, although not entirely eliminated, have been superseded by refined and more delicate ways of disposing of criminals.

With the gradual evolution of medicine it was to be expected that the detection of crime should manifest advancement by more scientific methods. When one compares modern methods of discerning crime with the old crude ways, prior to the Bertillon System of fingerprinting which was an outstanding discovery of the latter part of the nineteenth century, the change is bewildering. The enactment of law is but a sequence to crime, and to what extent the law has deterred crime is problematic. No doubt the thought of punishment checks the ordinary perpetrator from doing wrong in many instances, but apparently it has done little to eradicate the organized criminal. Until comparatively recent years the manner of coping with the organized and educated criminal was inadequate and the underworld had the upper hand. It became perfectly evident that in order to handle the situation it was imperative to set up new and scientific measures of detection in order to retard the progress being made by the

* Read before the Cordell Historical Society of the University of Maryland, Baltimore, April 29, 1942, as a part of the Third Graduate Week in Medical History of the Institute of the History of Medicine of the Johns Hopkins University.

† Chief Medical Examiner of Maryland.

worst type of criminals. To this end a number of large cities in Europe, about 150 years ago, started the pendulum swinging against crime by establishing crime laboratories in their police departments to study the methods used by the criminal. The old police ways were discarded and newer ones adopted, and through research steady advances were made. The medicolegal institutes of Europe resulted from these efforts. Through them a better cooperation was effected between police departments, law enforcement agencies, and the medical profession. The close association of these institutes with the medical schools in Europe was another step forward.

It is not the intention of this paper to discuss fully the legal institutes of medicine in Continental Europe, or to make a comparison between them so as to evaluate their work. It would be entirely too large a subject to handle at this time and in order to stay within the bounds of the medical examiner system in the United States, restriction is essential.

It is desired, however, to trace briefly a similarity between the medicolegal institutes of Europe and the medical examiner system as practiced here in the United States, and to draw a few conclusions as to the relative value of the two organizations. The one important purpose of the two great systems is to solve crime. There is no doubt that the medicolegal institutes of Europe proved their value and worth, and since their inauguration have continually added to research in forensic medicine. One must acknowledge that these foreign institutions held the foremost position in criminology and their methods and technic were studied by Americans in order to detect and combat successfully criminal acts and their perpetrators.

Prior to the establishment of the medicolegal institute at Vienna in 1804 the methods of handling crime and the criminal were decidedly inefficient in Europe. No doubt the methods differed in the several countries according to the customs, regulations, rules and laws and depending upon the nature, type and gravity of the crimes. Much has been said and written regarding the institutes of legal medicine. No one can deny their worth if properly operated by competent medical staffs. Their outstanding advantage lay in their being connected with medical schools and being integrated with professional teaching and research.

Legal medicine now is taught in the medical schools of the United States but not to the extent that it should be. Nevertheless, some of the important or essential points are taught. In spite of this fact there has recently been a reduction in the number of hours devoted to the subject. Several years ago the medical schools gave a course of from sixteen to thirty-two lectures in medical jurisprudence and hygiene. Hygiene constituted at least 75 per cent of the subject. In recent years the two subjects have been separated and to much better advantage to the student. There

may be in the near future a reawakening and legal medicine may come again into its own.

Lectures and special laboratory courses including forensic pathology and toxicology could be established easily in the medical curriculum and need not be made obligatory. The course could be given in a separate department or in connection with the department of pathology. No doubt there would be a number of students who would have sufficient interest to take a course in legal medicine. It is surprising that more medical schools have not seriously considered such a course as a part of their curricula. In Maryland the State Postmortem Examiners Commission could foster such a move and lend itself to the creation of a medico-legal institute in one of the medical schools in Baltimore. The School of Law of the University of Maryland and the University of Baltimore could supply the necessary legal talent. The experience of the State's attorney and his staff in criminal proceedings could be of service in teaching this subject.

In more recent years the toxicologist has assisted in reducing the number of cases of unsolved homicide. The psychiatrist in the past few years has also played a most important part in the evolution of forensic medicine. In this connection it is of interest to note that prior to 1917 in Maryland and in Baltimore City in particular, the State's attorney and the judges officiating in the criminal courts selected psychiatrists of their own choosing to examine the accused. It was also customary for the attorney for the accused to select his own psychiatrist to examine his client. To say the least this was unsatisfactory, for it sometimes resulted in a verbal battle between opposing experts and the development of much contradictory testimony. This was corrected to a large extent in 1917 by the appointment of Dr. John R. Oliver, of the Schools of Medicine at the University of Maryland and Johns Hopkins University, to officiate as psychiatrist to the Supreme Bench. At first it was apparently a voluntary semi-official unpaid position, but soon it proved its value and Dr. Oliver was given official status by being named bailiff of the Supreme Bench. He thus became the first official medical advisor to that body in Baltimore. The position was made permanent through legislative action in April, 1920. Dr. Oliver held the position from the effective date of the law, January 1, 1921, until 1930. Because of the impartial nature of the opinions which he gave to the bench his services were also requested frequently by the defense attorneys. Dr. Manfred S. Guttmacher succeeded Dr. Oliver in this important post and has given most creditable and satisfactory service both to the Supreme Bench and to the defense attorneys. This is witnessed by the fact that seldom are other psychiatric experts called upon to testify.

THE MEDICAL EXAMINER

The foremost advance in this country as an outgrowth of the European system of forensic medicine was the establishment of the medical examiner system in Boston in 1877. Since then it has been inaugurated in New York City, in Newark, and Essex County, New Jersey, and in Maryland. The reason for these changes is that the medical examiner service, based upon scientific principles and administered by full time trained pathologists, is much more effective than the coroner system which it has replaced in these few areas.

Dr. Timothy Leary, medical examiner of Suffolk County, Massachusetts, in an article in the Ninth Series of the special Rockefeller Foundation publications entitled "Methods and Problems of Medical Education" (1928) gave a complete historical review of the coroner system of England and a minute description of the coroner system in Boston prior to the adoption of the medical examiner system in 1877. This interesting material appeared in shorter form in the August 20, 1927 issue of the Journal of the American Medical Association. Dr. Leary in his article said that the coroner system is an early Saxon institution. "The Office of Coroner is of so great *Antiquity*," saith the well-read Judge Dodridge, "that its Commencement is not known." It was called by several other names, such as "Coronarius" and later "Coronator," and in Scotland the "Crowner." There is some confusion as to the date and under whose reign the coroner system originated.

E. Paul Mason in an article entitled "Coroners," read before the Barristers' Club in Baltimore on April 28, 1938 and published by the Daily Record on May 9, wrote that "The office of the coroner is one of the most important and ancient known to the common law. A coroner or coronator, was so called because he had principally to do with pleas of the crown, or suit wherein the king was immediately concerned. The office is first mentioned in a charter granted in the year 925 by King Athelstan to the authorities of Beverley . . . The office has lost much of the very high honor which formerly appertained to it, making striking contrast with the importance and high estimation in which it was held by our ancestors in days when none but gentry and knights of the shire were deemed eligible." The first formal statute after Magna Carta dealing with the coroner is that of Edward the Confessor in the year 1276. His duties were quite diversified, such as "to assay all weights and measurements in our Verge," also to keep the "Pleas of our Peace," and in addition to investigate felonies, accidental and other violent deaths; and finally, duties similar to the coroner system of the United States. Mention should also be made here of the valuable Bulletin No. 64 of the National Research Council (1928) entitled "The Coroner and The Medical Examiner," and later bulletins

in this series dealing with these and other medicolegal matters (No. 83 and 87).

It is of much scientific and civil interest and of unusual historic importance to consider what led to the abolishment of the old coroner system and its replacement by the medical examiner in Suffolk County, including Boston, in Massachusetts on July 1, 1877. Dr. Leary relates that a scandal arose out of the reappointment of an unfit person as coroner. It was in 1877 that this brought matters to a head and led to concerted action by the State legislature with the aid of the Massachusetts Medical Society and the Massachusetts Bar Association, under the leadership of the late Theodore H. Tyndale. These successful efforts to abolish the coroner system in this one locality have been followed in a few other large cities and also in the State of Maryland. The pioneers in this movement perhaps had the vision that their medical examiner system might be adopted in all the states of the Union. At least, the seed of an efficient and modern system has taken root in several places. After a number of years had elapsed the largest city of the United States and shortly thereafter Essex County including Newark, New Jersey adopted the new system and gave up their coroners. Between these preparatory stages some of the New England states instituted modified coroner systems and the next step, not far distant, it is hoped, will be the inauguration in these states and many others of the medical examiner system as practiced in the cities already mentioned.

The noble work done by Mr. Tyndale of Boston, who led the fight for this epochal change in that city, merits further consideration. The desire to abolish the coroner system and its jury and to divorce its judicial and medical functions was strongly advocated by Mr. Tyndale. He wrote that whether a given death resulted from natural causes or not, so far as the body indicated, the physician's examination was competent and alone competent to decide; whether the evidence of violence being established by such examination, that violence constituted a crime and, if so, what crime, the testimony of witnesses to external facts and the law applied to those facts alone could determine. "In technical language, whether a homicide has been committed or not is a medical question; whether that homicide be justifiable homicide or manslaughter, or murder, is a legal question." In the examination and investigation of some cases of sudden death, for example, two questions arise: first, how the death occurred and, second, by whom was it caused. The Massachusetts Medical Society pointed out that the medical profession is concerned in the first question and the law and the courts in the second.

It is clear that two separate and distinct examinations are involved, that the inspection of the body, the autopsy, and the inquiry into the cause of

death should be given to the medical profession, while the necessity for a further inquest and its conduct, when decided upon, should be committed to the legal profession with its detectives and courts. Based upon these recommendations the bill was prepared by Mr. Tyndale with the full support of the medical and legal professions. It was presented to the Massachusetts lawmakers and after some amendments became the present medical examiner law of Suffolk County and Boston.

Because it was the first such law in the United States and in view of its vast importance, the Massachusetts law of 1877 deserves some special comment. It placed the responsibility of naming the medical examiners on the governor and they were appointed for seven years. The act also specified which were to be considered medical examiner cases, mentioned the types of cases in which inquest should be held at the discretion of the examiner, and indicated that "justice of the police, district or municipal courts, or trial justices have jurisdiction over the place in which a body was found." This was amended and the inquest was limited to "acts or negligence of another, or from the operation of a railroad, street railroad, railroad for private use, or motor vehicle . . . The Attorney General or district attorney may call an inquest following death from any casualty." These special facts are mentioned in order to contrast the Massachusetts system with the more recent one established in Maryland in 1939.

Dr. Leary writes of the first fifty years of the Massachusetts experience: "As one looks back over the record of these years, they are remarkably free from serious faults and wholly free from evidence of duplicity, in contrast to the coroner period. Errors have been made, human mistakes of oversight and inaccuracy, but the history of these years is a record of increasing confidence of the public and the courts in the impartiality and general accuracy of observations of the medical examiners." These quotations are necessary because they summarize aptly the conception of the modern over the older coroner system. Dr. F. W. Draper was the first medical examiner of Suffolk County. Time will not permit further consideration of the remarkable work done by the new system in Suffolk County since its inauguration. However, it should be noted that there is a Massachusetts Medicolegal Society that has made admirable efforts to interest and foster the teaching of legal medicine in that state.

New York City enjoys an enviable standing as to the efficiency of its medical examiner system and the progressive manner in which it has been conducted. Several of the outstanding elements in the New York City system will be considered briefly. Dr. Charles Norris, the first chief medical examiner, was an unusual, outstanding organizer and teacher of legal medicine. His fame as such will be mentioned in connection with the medical examiner system wherever it is adopted in any state in the Union.

Dr. Norris reported in the Ninth Series of the Rockefeller Foundation publications previously mentioned that "great credit is due not only to those men who worked for the passage of the law which inaugurated this system (in Massachusetts), but also to such officials of the present day (1928) as Dr. George Burgess Magrath and Dr. Timothy Leary of Boston, and others, who are devoting the best years of their lives and their energies to this valuable service to their state and to humanity and science."

The medical examiner system in New York City replaced the coroner system through a legislative act passed on April 14, 1915 which became effective on January 1, 1918. This was Chapter 284 of the laws of New York State for the year 1915. The chief medical examiner in this great city is appointed by the mayor from the classified civil service list. He must be a physician, a skilled pathologist and microscopist. The chief medical examiner appoints the deputies, assistant medical examiners, scientific experts, officers, and other employees.

The New York law permits and demands an organization that will function to the letter and is specific as to what may be done. It protects the interest of the deceased and his kin and their rights in the disposition of personal effects. The medical examiner's duties are to investigate the medical causes of death, and to take possession of articles which may shed light on the death of the individual. If in his opinion an autopsy is necessary to establish the true cause of death, the law clearly outlines his obligation in this connection. A full description of the New York law is given by Dr. Norris in the Rockefeller Foundation publication mentioned. Many of the best points of the New York law have been incorporated in the Maryland medical examiner law and will be commented upon when the Maryland law is considered.

The medical examiner system of Essex County, which includes Newark, New Jersey, started to function through a legislative act passed on March 19, 1927. Since its inauguration Dr. Harrison S. Martland has served as the chief medical examiner and under his supervision efficient and creditable work has been accomplished. The law follows for the most part that of New York, except for one important difference. In Essex County the chief medical examiner is not required to summon a jury of inquisition.

Before considering the law enacted by the Maryland legislature of 1939 which abolished the coroner system, except in Cecil County, and in its stead created the State Department of Postmortem Examiners, it may be of interest to review briefly the office of coroner in Maryland. To this end the author is deeply indebted to Dr. Horace E. Flack, director of the Department of Legislative Reference of Baltimore City. His aid is sincerely appreciated and Dr. Flack's personal communication of March 6, 1942 will be used.

The existence of the coroner law of Maryland, according to the Archives of Maryland (Vol. 53), dates back to 1666. In that year the coroner appeared as a distinct official; prior thereto the office of coroner was combined usually with that of the sheriff. The coroners in Maryland operated continuously during 273 years. Many changes were made and early efforts to improve the coroner law were instituted. By an act passed in 1671 the coroner's duties were limited and defined to include the holding of inquests on the bodies of those who met their death by misadventure, murder, suicide, and other forms of violence, as well as the serving of writs to which the sheriff was a party. In 1777 the office of coroner was made appointive by the governor for a two year term.

Later important changes appeared in the Maryland Code of Public General Laws of 1860 in Article 25. Section 3 of that article provided that the corner should not summon or hold any jury of inquest where it was known that the deceased came to his death by accident, mischance or in any other manner except where the said person died in jail or where there were circumstances attending the death which amounted to a strong probability or reasonable belief that the deceased came to his death by a felony. Section 4 authorized the jury or the coroner to require the attendance of a physician in cases where there were indications that the death was caused by violence, and Section 5 provided for penalty in case a physician failed to attend. The significant point here is that a physician for the first time is mentioned in connection with the work of the coroner. The physician was not designated as an official and his choice was left to the coroner.

In 1868 the law authorized the governor to appoint a physician as the sole coroner for Baltimore City. As the population of Baltimore increased more coroners were appointed by the governor, and in 1939 there were ten physicians serving as coroners in Baltimore. Eight of these were on a district basis, one served at large, and one handled automobile fatalities. One must bear in mind that it was only in recent years that physicians were appointed as coroners in most of the Maryland counties, the medical as well as the legal functions of the office having been cared for by laymen. Some of the counties, up to the change in the law creating the medical examiner system in 1939, continued the lay service for this important office. The appointees, both in city and county, had the backing usually of politicians. Apparently little effort was made to investigate the fitness or qualifications of the selectees.

By an interesting Baltimore City ordinance, No. 20, approved on March 8, 1890, the Board of Health of the City was authorized to appoint two physicians with the titles of medical examiner and assistant medical examiner, whose duty it was to perform all autopsies requested by the coroners

or by the State's attorney of Baltimore City. The first physician so appointed in 1890 was Dr. N. G. Keirle, who served in this special capacity for over twenty-nine years. During these years he had several assistants, Dr. B. P. Muse, Dr. J. R. Oliver and Dr. Henry Branham. The writer began in 1917 as assistant to Dr. Branham, and on June 1, 1919 was appointed assistant medical examiner for Baltimore. He became medical examiner on January 1, 1920 and was assisted by Dr. Standish McCleary from that date until the death of the latter in 1934, and thereafter by Dr. Conrad Acton. The title of the medical examiners was changed to post-mortem physicians at the start of 1921. Their work was largely subject to the coroners and therefore limited to the State's attorney's cases.

While many of the old-time coroners were honest gentlemen, the inefficiencies of the coroner system had given the thinking public and lawyers and physicians concern for many years in Maryland. Finally, the time approached when a change was considered imperative. It was prompted also by the good reports emanating from the other cities that had benefited by the medical examiner system. In this connection it should be mentioned that a group of Maryland physicians had been working quietly for the change. The City of Baltimore was fortunate in having a State's attorney who had served in that position for ten years and who personally knew the shortcomings of the coroner system. When his candidacy for the high office of governor of the state was announced and after his election many knew that he had a sympathetic ear and was ready for the attempt to make the change. It was considered that he would definitely give his personal support to such an undertaking.

In view of the interest of the new governor and his desire to improve existing conditions, the time seemed appropriate to make a special effort to change the law. With this idea in mind the Medical and Chirurgical Faculty of Maryland appointed a committee consisting of Dr. Richard T. Shackelford, chairman, Dr. Manfred S. Guttmacher, and Dr. Peregrine Wroth, Jr. to investigate and study the coroner system in Maryland. The chairman in October, 1938 made a complete and unprejudiced report advocating the abolishment of the coroner system. The committee performed its duties admirably and the report was approved. With the aid of Dr. Flack, who was mentioned earlier, a satisfactory bill was drawn and presented to the State legislature on January 1, 1939. In this bill the best features of the medical examiner laws of New York City and Newark were incorporated, together with a number of original and unique provisions.

The bill passed by the Maryland legislature was chapter 369 of the State Laws of 1939. It abolished the coroner system and created in its stead the medical examiner system, after being approved by Governor Herbert R.

O'Connor on May 11, 1939. The entire State of Maryland, with the exception of Cecil County, was included under the new law which became effective on June 1, 1939.

The Maryland law is too long to describe in full. However, several important departures from the earlier medical examiner laws should be mentioned. Chief of these is the commission form of executive power over the medical examiner service. The law created the Maryland State Department of Postmortem Examiners and established the Maryland Postmortem Examiners Commission composed entirely of ex officio members. These are:

The Professor of Pathology of the School of Medicine, University of Maryland

The Professor of Pathology of the School of Medicine, Johns Hopkins University

The Director of Health of the State of Maryland

The Commissioner of Health of Baltimore City

The Attorney General of Maryland.

The original members were, respectively: Dr. Hugh R. Spencer, Dr. William G. MacCallum, Dr. Robert H. Riley, Dr. Huntington Williams, and Judge William G. Walsh. From the first meeting of the Commission held on May 11, 1939 Dr. MacCallum has served as chairman, Dr. Riley as vice chairman, and Dr. Williams as secretary. By an amendment to the law the superintendent of State police was substituted for the attorney general and Col. Beverly Ober thereupon replaced Judge Walsh. In the author's opinion this form of Commission cannot be improved upon since each member serves ex officio because of his excellent qualifications.

The law gives specific directions to be followed by the Commission and it fully outlines the qualifications and duties of the chief medical examiner and his assistants. It would seem that politics cannot possibly play a part in the administration of this service in Maryland. The Commission holds regular monthly meetings in the Medical and Chirurgical Faculty building and guides and reviews the work in the City of Baltimore and in all the counties excepting Cecil County.

The chief medical examiner's office is required by the law to keep complete records of deaths investigated in the city and counties. Records are kept of all autopsies performed in the Baltimore City morgue, or by a medical examiner or approved pathologist for any county. A report of the investigation or the protocol of an autopsy is sent to the State's attorney of Baltimore City or of any county, if in the judgment of the medical or deputy medical examiner a legal investigation is necessary for the presentation of the case to the grand jury. Also, if it is necessary, the Police Department

of the city or county may be requested to continue the investigation; should the additional information justify the reopening of a case, the medical examiner may request it. The State's attorney of the city or county may exercise the same privilege.

It is the primary duty of the Commission to protect those concerned after a death and to this end the medical examiner law was created to see that the interest of the people is protected and that they shall be dealt with honestly. The information received through routine or special ways and means, being obtained by public officials, therefore should be made available to the family, or their legal representative or corporation agent. Through this system an insurance company can close a case promptly and in doing so relieve the family of considerable hardship. This often eliminates unnecessary court procedure.

Under the Maryland State law, as in other similar state laws, a medico-legal autopsy seeks evidence to serve the special needs of law. The Maryland law says specifically: "If, however, in the opinion of such medical examiner, an autopsy is necessary, the same shall be performed by the chief medical examiner, an assistant medical examiner, or by such competent pathologists as may be authorized by the chief medical examiner." The medical examiners need not obtain permission from a magistrate or State's attorney. Therefore, they are not handicapped and make their own decision regarding autopsies. There are no interfering influences and the responsibility is on the examiner. No delay is occasioned through requesting permission of legal agencies.

Again the law is most explicit in an important matter: "The records of the office of the chief medical examiner, and of the several deputy medical examiners, made by themselves or by one under their direction or supervision, or transcripts thereof certified by such medical examiner, shall be received as competent evidence in any court in this State of the matters and facts therein contained."

The law also wisely omits inquests, stating that the "Chief medical examiner, assistant medical examiners and deputy medical examiners shall not have the power to be required to summon a jury of inquisition." The law definitely separates the legal and medical duties and yet creates a close cooperation between the legal agencies and the police departments. This system, through separate investigation of a death, is much more satisfactory. If the case is turned over to a grand jury, it is much better prepared for prosecution. The evidence is more direct and trustworthy.

A great improvement likewise has been brought about in the accuracy of the causes of death as placed on the death certificates for medical examiner cases. This results from the more careful and efficient investiga-

tions of the deaths as compared with the coroner system. It is not generally known that about 20 per cent of all Baltimore City deaths were formerly certified by the coroners.

The Commission soon after its organization set up regulations governing medical examiner cases in hospitals. These rulings have made the Maryland medical examiner system unique and greatly simplified the question of handling hospital deaths. Among other things they brought to an end the unsatisfactory ruling of the coroner that any hospital death occurring less than twenty-four hours after admission should automatically be a coroner's case. They established guides for determining the meaning of the terms medical examiner case and sudden death, and specified certain types of medical examiner cases that could be released officially for hospital autopsy, subject to the signing of the death certificate by the medical examiner. They also required hospitals to appoint responsible agents to handle medical examiner cases and to submit specified reports to the police and to the chief medical examiner.

In 1939 Maryland joined a selected group of areas in replacing its time honored but outmoded coroner system with a method that is giving the people a better service. What is needed now is a more general interest in this matter of medicolegal administration, time and opportunity for the new program to expand so as to reach its maximum usefulness.

Acknowledgement. The author wishes to express his personal appreciation to Dr. Huntington Williams, Commissioner of Health of Baltimore City, for his valuable assistance in the preparation of this paper.

ADDRESS TO THE CLASS OF 1942*

C. REID EDWARDS, M.D.†

BALTIMORE, MD.

Mr. Chairman, Dr. Byrd, members of the Faculty, sacrificing and anxious parents of this graduating class, friends, and finally the Class of 1942, I humbly admit my embarrassment in appearing before you tonight and confess my inability to speak adequately upon such an important occasion or to give you the information and advice which you sorely desire.

That you are graduating in medicine at a propitious moment in the history of the world stands without argument. There never has been a time like it. You are at the end of your course of undergraduate training, you have completed a long period of hard work, you have spent many hours in class, laboratory and clinic, and alone with your books late at night and sometimes all night. You have met all the requirements for a medical education to warrant your graduation. Tonight you become physicians, doctors of medicine in your own right. As a class you function no longer. Henceforth you will travel alone. By your own choice of a profession you have asked for responsibility, and just as surely as there is a God in heaven you shall have it. You have acquired a certain knowledge. It is yours; no one could give it to you and no one can take it from you. You had to toil, to struggle and sacrifice for it. It will be as leaven to the dough. I congratulate you from the bottom of my heart, and welcome you into the greatest profession on earth. You are now to go out into the world to do your duty. You are not sent out, nor are you cast out but, following the natural course of events in the program you have planned for yourselves, you have progressed until now you must go out on your own if you would go forward.

So you go out into the world. What kind of a world, you ask. And shamefully, as of the generation preceding yours, I must answer—a sick world. Before considering some of the problems that are more closely associated with our profession, I prefer to direct your attention to those intimately concerned with the world about us. This chaotic world, this world at war, this sick world, this world which, because of conflicting ideas, selfish interests, uncontrolled emotions, heartless ambitions, cruel conquests, foolish nationalism, burning hates, and an ill advised attempt at racial supremacy, is almost ready to descend into an abyss of total destruction. This is the world in which you must now take your respective places, perform your individual tasks, and eventually help to reconstruct.

* Address delivered at the Pre-Commencement Exercises, School of Medicine, University of Maryland, The Lyric, Baltimore, May 29, 1942.

† Professor of Clinical Surgery, School of Medicine, University of Maryland.

It is difficult to say just where the responsibility for the present situation rests, but it is true that it did not originate with us. I refer to us as a nation, the greatest nation on earth. Our forefathers believed completely in the duty and privilege of worship as one desires; the right to ownership; the opportunity for education; the abolition of slavery; the freedom of speech; the protection of property; the safeguarding of health; the development of the arts and sciences; the defense of the home; the inviolability of the family, and the sacred rights of representation. Equal opportunity for all was their motto. And, as a result of their thrift, ingenuity, labor and sacrifice, there emerged a nation which is ours to inherit, to protect, and to pass on to succeeding generations. A great nation, not only because of its financial wealth, its natural resources, its rivers, its mountains, its people, its educational advantages, its industry. No, great because long since it has ceased to desire geographic expansion or political control, great because it has learned how to live and wished others to share that joy, great because it has always been a democracy, great because, with Abraham Lincoln, we are resolved that government of the people, by the people and for the people shall not perish from the earth. Great because of an Almighty God and our men at arms we are determined always to be a democracy.

It is of this democracy that you are now a part. No country in the world offers the opportunity in medicine or in citizenship that is offered you. And, when a little later you subscribe to the ideals of the Hippocratic Oath, you may at the same time pledge your everlasting allegiance to and support of this democracy which is ours. Then you will confidently express your faith in two institutions whose worth has long since been proved and which hold out bright promises for the future.

It is frankly admitted that there have been many mistakes, but our progress as a nation has usually been forward. In recent years there has been much lamentable confusion, but time permits of evolutionary progress and we now witness an attempt at a social revolution, the outcome of which cannot be foretold, but that it will lead to a better way of life naturally follows. If we will exercise the same degree of patient intelligence exhibited by such men as Washington, Marshall, Jefferson, Adams, and others of the cradle days of our democracy, we shall come out of this disaster with as firm a resolve and as clear a purpose as did they. But we are opposed by the most vicious enemies the world has ever seen.

It is hard to believe that our catastrophe had its beginning anywhere else than in Western Europe, and that is where our greatest enemy resides. Historians and economists usually write into their accounts of wars the evils of economic inequality, and credit wars of conquest as necessary measures for the procurement of raw materials for those who do not possess them. But it is difficult for a casual reader of the records of events following the first World War to overlook some real facts. Maybe the Treaty of

Versailles imposed too much punishment on the people who set out to conquer the world in 1914. Probably we cannot appreciate the economic pressure that stimulated Nazism to promote a revolution in Spain, to be followed by a desire for conquest by Fascism in Italy, a Fascism led by a pompous blunderbus who, under the mistaken belief that he had a reliable ally in Hitler, soon found himself with his country completely engulfed in an evil tide of ruthless conquest that led to their complete political and national subordination. No, it is difficult to believe that had Germany in the seven years between 1933 and 1940 spent one-fourth the sum devoted to the preparation for war in domestic venture, this need for conquest would have existed.

Had Japan peacefully sought an agreement with China, Russia and the United States, whereby she could have spilled some of her crowded millions over into adjacent territories, she may have been able to stabilize her finances, develop a greater commerce, to have saved thousands of lives, and have avoided a war which will eventually send her down to ignoble defeat and utter destruction.

These nations have first enslaved their own people by snatching all rights and privileges from them, have destroyed every semblance of culture, deprived them of educational advantages, created great armies, used every device of mechanical ingenuity and every chemical combination they could think of to destroy all peoples of the earth whom they think stand in their way. It is difficult to conceive that Germany, from which music, poetry, science, and medicine have come should, with maniacal devotion, follow such leadership. Their progress in Nazism has reduced them to the lowest level of bestial existence ever attained by man. Political intrigue, military ambitions, and selfish bureaucracy have led to totalitarianism, and totalitarianism is the antithesis of democracy.

This is the unnatural, chaotic world about us into which you must go, each to perform his task. If I am hard on you, I am sorry, but I must speak my convictions. We face an enemy who is bent on a physical destruction of our country, its institutions and manpower. More than a quarter of a century in surgery forces me to a materialistic view, for in the practice of medicine we learn to accept what is presented in a patient, not what is desired. What I am trying to say to you is that the world is afflicted with a sore malady. Nazism, Fascism, and Japanese nationalism are the cancer in human society today. Their evils would permeate every barrier, whether governmental or international, and infiltrating our democratic structures would strangle them and enslave the world. These malignant monsters have risen up to destroy us, and in all sincerity I say to you that there can be no peace in this world until every vestige of this atrocious evil has been eradicated from among us. While the road ahead will be a hard one for us all to travel, ultimately it will lead to victory. Fore-

seeing these difficult tasks I proclaim to you that I am not a defeatist, rather, I would concur with William Cullen Bryant, who wrote

“Truth crushed to earth shall rise again
The Eternal Years of God are hers
But Error, wounded, writhes in pain
And dies among his worshippers.”

May we now consider our own profession, for there is where your interests lie. It would be sheer neglect to attempt to speak on an occasion such as this without referring to Hippocrates. So much of worth has been written about him, and has been said so well, that I can only feebly indicate to you that Hippocrates realized most men were anxious to blame their misfortunes on something other than their own ignorance, and were eager to avoid taking responsibility for their own faults. As a philosopher, he pointed out a hard road for his followers. It meant putting aside the childish, dream-like myths, as those of Apollo and his chariot, Aesculapius and his snake, Zeus and his thunderbolt, and all the host of gods and demons and spirits which have saved men from taking responsibility. He rescued medicine from speculation, sought facts and recorded them. His terse comment—“To know is one thing, merely to believe one knows is another. To know is science, but merely to believe one knows is ignorance”—is a jewel of the mind, and has been a guiding fact in research for over 2000 years. Hippocrates, with his honesty, his insistence upon clear reasoning and upon observation of facts rather than speculation, expresses the ideal of our medicine. He is the demigod of modern medicine and has been the stimulating influence on the lives of countless physicians through the succeeding centuries.

Galen, was the next of importance to come into the field. He picked up where Hippocrates stopped, systematized medicine further, learned much about anatomy, introduced experimentation, and was a voluminous writer. When, however, in his old age he laid down his pen, he had written *finis* to a chapter in medical progress. Men were no longer concerned with the search for facts, because the diseases of society rather than the diseases of men held their attention. The Roman Empire was dying. Great physicians disappeared. With the decline of civilization, peoples turned to false prophets and fortune-tellers. Magicians and peddlers had their day. Civilization moved backward. How important this fact should be to us today, facing, as we do, a decline in civilization.

For centuries the history of our profession was black. Here and there a noteworthy contributor appeared on the scene, but there were few for about a thousand years. It was not until less than a hundred years ago that medicine came out of the dark ages. Of course, much in the previous two centuries had been contributed in physiology and anatomy, but not until

the epochal work of Pasteur, Koch, Kocher, Lister and others did we see the dawn of a new type of medicine. But with the early light of a new day in medical history we note many changes which have affected medicine for all time.

Pasteur, that noble French scientist who, as a chemist, made known his discoveries which, when considered at their real value and applied to medicine, completely revolutionized medical thinking, became the pivot for all time about which the history of medicine must revolve. When, after examining some bacteria through a microscope, he wrote to a friend, "I have knowledge of the world of little ones" he introduced a new study which has led to the security of habitation in a civilized world. He was a man with a vision. At the inauguration of the Pasteur Institute he made the following prophetic statement: "Two opposing laws seem to me now in contest. The one, a law of blood and death opening out each day new modes of destruction, forces nations to be always ready for battle. The other, a law of peace, work and health, whose only aim is to deliver man from the calamities which beset him. The one seeks violent conquests, the other the relief of mankind. The one places a single life above all victories—the other sacrifices hundreds of thousands of lives to the ambition of a single individual. The law of which we are the instruments strives even through the carnage to cure the wounds caused by the law of war. Treatment by our antiseptic methods may preserve the lives of thousands of soldiers. Which of these two laws will prevail God only knows. But of this we may be sure, that science, in obeying the law of humanity will always labor to enlarge the frontiers of life." How well that fits our situation today I need only suggest to you.

It is interesting, in a period like this, to observe that medicine has made progress in leaps, and that these leaps are closely timed with wars. Up until a hundred years ago the wounded in a war were considered a nuisance. They greatly handicapped the advancing army. They were collected in filthy unused buildings, herded together, and left to die. But in the Crimean War, Florence Nightingale made an observation, collected some women about her, and instituted a routine in the care of the wounded that placed organized service on their part on a higher plane, and thus we note the birth of the nursing profession. For thousands of years women had served in the sick room, but never before had their efforts been recognized properly nor had the organization of these women been sponsored. Shortly following this, after the battles of Magenda and Salerno, an observer, noting the advantages offered to the wounded when attended by trained nurses, conceived the idea of having all belligerents recognize the importance of taking care of the wounded, and as a result the Red Cross was organized.

After the work of Lord Lister and the introduction of aseptic surgery, in each succeeding war new advantages were found. In the Spanish-American

War we lost more men from typhoid fever than from wounds, but sanitary methods introduced following this war made it possible to prevent typhoid fever almost entirely in the first World War. During that war, the control of infection was developed to a high degree of efficiency. Subsequently, the study of infection has tested the skill of many investigators and we now go into the present war in a position largely to control and prevent infection.

The task set for labor and industry in preparing for battle in this day is almost beyond conception. The soldier, sailor or combat pilot must be supplied with fighting material. In the previous World War two technical laborers were required to supply one soldier at the front. This is strictly a mechanized war and now eighteen skilled workmen are required to equip one combatant.

The interval between these wars has marked the greatest advance in industrial medicine and surgery ever recorded. Industrialists know that the health standards must be maintained at a high level if men and machines are to function together for the greatest production of each. Fatigue must be reduced to the minimum. Accidents must be prevented wherever possible, and the injured must receive adequate and prompt surgical care. Preventive medicine in industry and the study of the toxicity of new synthetic products have opened a field for practical research as fertile as it is varied. These projects have placed an ever increasing demand on our profession and have attracted many physicians.

Public health measures have been developed until now no part of our great country is without protection. The prevention of disease and protection of health are applied first in prenatal life, continued throughout the span of life, and extended to the remote sections of the world, there to detect maladies which may be transported to our shores.

Medical education has been improved greatly, expanded, and extended, always with the idea of meeting adequately any new demands which may be made upon it. Suffice it to say that our medical profession, ever alert to its responsibilities, is making every effort to do its job now, both at home and with the fighting units, wherever they may go.

This war is the first one on this continent where there may be as many casualties among civilians as among the military forces. If the enemy succeeds in bombing our larger cities we must anticipate that there will be a maintenance of the same ratio which has existed in Europe, namely, three civilian to two military casualties. This situation places a greater responsibility on the medical profession than has ever existed before. Civilians and the military forces alike must be provided with medical care. Industry cannot be neglected, and medical education cannot lag. In fact, more doctors must be educated in less time.

To meet the demands made upon it the medical profession has gone on record as being willing and anxious to do its duty. Every physician has or

will have soon registered with the Procurement and Assignment Commission, and will then take his place either at home or with the military forces, wherever he is best equipped to serve and is most needed.

As you now take your respective places with the rest of us, you likewise declare your willingness to take your chances and to accept your assignment with acknowledged pride in your profession and an innate desire to serve humanity as only you can, for always each is a small cog in the wheel of great unity of the medical profession and, singly or together, we meet our responsibilities. No success can come to our profession unless each member responds to his task as though he were fully conscious that there is no one else who can or will do it.

At Pearl Harbor, on that eventful day when Japan made her unwarranted attack on our naval forces, Dr. John Moorehead, an eminent New York surgeon, skilled in the surgery of trauma, was conducting one of several scheduled clinics. He had just begun his lecture when word came that bombs already had fallen, many had been wounded, and that surgeons were needed in the hospital immediately. With the other surgeons in Pearl Harbor he worked for days attempting to save life and limb. He had as his assistants Japanese, Hawaiian and American doctors. Together they worked to save the wounded. It did not matter that Americans were injured by shells fired by Japanese and made from scrap iron bought from Americans. All that mattered was that there were broken bodies to be mended.

Dr. Moorehead's services were as efficient as the occasion was strategic, and on Christmas Eve, in the quiet of his room, he wrote a prayer in which he asked that in humility he might be granted power to render scientific service to those in need of it and to live amicably with his fellow men. Oh, to go where duty calls and then to accept the duties as they come.

Tonight we travel in mind and heart with those of our associates whom we know so well and trust so implicitly. They heard the call of duty, they responded, and in some far distant land they will practice the healing art.

John Hay, secretary to two presidents, ambassador to the Court of St. James, Secretary of State, journalist, diplomat, but before that an American man of letters, has ably expressed the thought I would leave with you. In *Little Breeches* he tells of the lad who, interested in a little urchin with less than he had, found if necessary to rescue him from danger and starvation. Unable to secure help he did it alone, and then to himself said

"I think that saving a little child
And fetching him to his own
Is a derned sight better business
Than loafing 'round the throne."

PROCEEDINGS
of the
University of Maryland Biological Society

Officers of the Society

Marion W. McCrea, *Treasurer*
School of Dentistry
Baltimore, Md.

Sylvan Forman, *Treasurer*
School of Medicine
Baltimore, Md.

Robert H. Oster, *Secretary*
School of Medicine
Baltimore, Md.

Ronald Bamford, *Secretarial Representative*
Department of Botany
College Park, Md.

Councillors

Walter H. Hartung
Edward C. Dobbs
C. Jelleff Carr
Thomas C. Grubb

ONE HUNDRED AND NINETEENTH PROGRAM MEETING

The One Hundred and Nineteenth Program Meeting was held on Wednesday, March 25, 1942, at 4:30 p.m. in the Bressler Lecture Hall. The following program was presented:

"A New Medium for Typhoid Blood Cultures," by Dr. Thomas C. Grubb, Department of Bacteriology, School of Pharmacy, University of Maryland.

"Thiamin (Vitamin B₁) Deficiency in the Cat," with sixteen millimeter film showing, by Mr. Guy M. Everett and Dr. Dietrich C. Smith, Department of Physiology, School of Medicine, University of Maryland.

A short business meeting was held.

Abstracts of the papers follow.

A NEW MEDIUM FOR TYPHOID BLOOD CULTURES

THOMAS C. GRUBB, PH.D.*

Blood cultures of patients suspected of having typhoid fever are extremely valuable in making an early diagnosis of the disease. In many instances, however, these cultures are contaminated with staphylococci which frequently mask the presence of typhoid bacilli. It has been found that the addition of p-bromocinnamic acid to the usual bile-

* From the Department of Bacteriology, School of Pharmacy, University of Maryland.

glycerol-peptone medium will inhibit the growth of staphylococci without appreciably inhibiting the growth of *Eberthella typhosa*. A number of experiments were conducted to determine the concentration of p-bromocinnamic acid and the pH of the medium which would most effectively produce this selective inhibition. When the inoculum contains large numbers of organisms, a concentration of 1:4000 of p-bromocinnamic acid at pH 4.6 will destroy the staphylococci present without affecting the growth of the typhoid bacilli. Since the number of typhoid bacilli in blood cultures is relatively small, further experimentation is indicated to determine the proper pH and concentration of p-bromocinnamic acid which will not inhibit the growth of small numbers of *E. typhosa* (10 to 100 per cc.) but at the same time completely suppress the growth of the common contaminating staphylococci.

THIAMIN (VITAMIN B₁) DEFICIENCY IN THE CAT

Sixteen Millimeter Film Showing

GUY M. EVERETT, B.A. AND DIETRICH C. SMITH, PH.D.*

A sixteen millimeter motion picture film was made showing the behavior of two cats during the development of thiamin deficiency. After three weeks on the vitamin B₁ deficient diet, during which time the two cats lost approximately 20 per cent of their body weight, the animals showed muscular weakness and marked disturbances in postural tone. Walking was awkward and unsteady. The righting reactions were much impaired and pupillary constriction in bright light was lessened. Interest in food had ceased. At this time any slight stimulus may have produced a convulsive seizure lasting several minutes. Both clonic and spastic spasms occurred.

Upon the injection of one milligram (333 units) of thiamin chloride the animals showed within an hour improved muscular coordination and a return of appetite. Convulsive seizures could no longer be evoked. In twenty-four hours recovery was practically complete.

ONE HUNDRED AND TWENTIETH PROGRAM MEETING

The One Hundred and Twentieth Program Meeting was held in conjunction with the University of Maryland Chapter of Sigma Xi on Tuesday, April 28, 1942, at 8:15 p.m. in Gordon Wilson Memorial Hall. The program consisted of a paper on "Functional Activities of the Anterior Lobe of the Hypophysis" by Dr. Herbert M. Evans, Morris Herzstein Professor of Anatomy and Director of Experimental Biology, University of California, Berkeley, California.

ONE HUNDRED AND TWENTY-FIRST PROGRAM MEETING

The One Hundred and Twenty-First Program Meeting was held on Wednesday, May 27, 1942, at 4:30 p.m. in the Bressler Lecture Hall. The following paper was presented:

"The Experimental Control of Sex Differentiation by Hormones in the Young Opossum," by Dr. R. K. Burns, Jr., Department of Embryology, The Carnegie Institution of Washington, Baltimore.

* From the Department of Physiology, School of Medicine, University of Maryland.

ALUMNI ASSOCIATION SECTION

OFFICERS

HENRY J. WALTON, M.D., *President*

Vice-Presidents

REAR ADMIRAL CHARLES H. T. LOWNDES J. WALTER LAYMAN, M.D. FREDERICK W. STEINER, M.D.
BENJAMIN S. RICH, M.D., *Secretary* KENNETH LEGGE, M.D., *Assistant Secretary*

EDWARD P. SMITH, M.D., *Treasurer*

Board of Directors

WALTER D. WISE, M.D.,

Chairman

HENRY J. WALTON, M.D.

EDGAR B. FRIEDENWALD, M.D.

BENJAMIN S. RICH, M.D.

GEORGE MCLEAN, M.D.

WILLIAM H. SMITH, M.D.

EDWARD P. SMITH, M.D.

CHARLES REIFSCHNEIDER, M.D.

KENNETH LEGGE, M.D.

Hospital Council

ALFRED T. GUNDRY, M.D.

GEORGE SARGENT, M.D.

Nominating Committee

JOHN E. SAVAGE, M.D.

Chairman

OLIVER S. LLOYD, M.D.

J. SHELDON EASTLAND, M.D.

WILLIAM SEABOLD, M.D.

FRANK GERAGHTY, M.D.

Library Committee

WILLIAM S. LOVE, JR., M.D.

Trustee Students' Rotating Fund

FRANCIS J. KIRBY, M.D.,

Chairman

R. L. MITCHELL, M.D.

A. F. RIES, M.D.

EUGENE HAYWARD, M.D.

Editors

EMIL NOVAK, M.D.

C. GARDNER WARNER, M.D.

Alumni Council

WILLIAM H. TRIPLETT, M.D.

THOMAS B. AYCOCK, M.D.

The names listed above are officers for the term beginning July 1, 1942 and ending June 30, 1943

PRE-COMMENCEMENT EXERCISES

MAY 29, 1942

The Lyric, Baltimore

ORDER OF EXERCISES

- I. THE PROCESSION: *The Coronation March*, Meyerbeer; *Pomp and Circumstance*, Elgar.
- II. INVOCATION: REV. BOYD R. HOWARTH, Rector of the Memorial Protestant Episcopal Church.
- III. GREETING: H. C. BYRD, B.S., LL.D., D.Sc., *President, University of Maryland*.
- IV. THE ADDRESS: C. REID EDWARDS, M.D., *Professor of Clinical Surgery, School of Medicine*.
- V. INTRODUCTION OF MEDICAL COUNCIL: H. BOYD WYLIE, M.D., *Acting Dean, School of Medicine*.

ARTHUR M. SHIPLEY, M.D., Sc.D., *Professor of Surgery*

HUGH R. SPENCER, M.D., *Professor of Pathology*

H. BOYD WYLIE, M.D., *Acting Dean of the Faculty and Professor of Biochemistry*

CARL L. DAVIS, M.D., *Professor of Anatomy*

FRANK W. HACHTEL, M.D., *Professor of Bacteriology*

CLYDE A. CLAPP, M.D., *Professor of Ophthalmology*

EDUARD UHLENHUTH, Ph.D., *Professor of Anatomy*

JOHN C. KRANTZ, JR., PH.D., *Professor of Pharmacology*
 WALTER D. WISE, M.D., *Professor of Surgery*
 J. MASON HUNDLEY, JR., M.A., M.D., *Professor of Gynecology*
 WILLIAM R. AMBERSON, PH.D., *Professor of Physiology*
 LOUIS H. DOUGLASS, M.D., *Professor of Obstetrics*
 THOMAS P. SPRUNT, M.D., *Acting Professor of Medicine*
 HENRY J. WALTON, M.D., *Professor of Roentgenology*

VI. INTRODUCTION OF GRADUATES: JOHN E. SAVAGE, M.D., *Associate in Obstetrics and Assistant in Pathology*;

PRESENTATION OF MILITARY APPOINTMENTS: ROBERT C. McDONALD, *Colonel, Medical Corps, U. S. Army*, and W. A. ANGWIN, *Captain, U. S. Navy*.

CLASS ROLL

William Alstrom Ahroon	Robert Clark Irwin
David Nathan Bacharach, Jr.	Hansford Fred Johnson
Earl Rudolph Baldwin, Jr.	Everett Davis Jones
Robert Amthor Barthel, Jr.	Theodore Kardash
Morton Edward Bassan	Joseph Francis Keeley, Jr.
Van Boring Bennett	Robert Allan Kiefer
Joseph Gordon Bird	Stanley Benedict Klijanowicz
Francis Dorsey Thomas Bowen	Lawrence Jacob Koleshko
Alexander Emmanuil Brodsky	Martin William Krepp, Jr.
William Luther Byerly, Jr.	John Gregory Kroll
Richard Alexius Carey	Paul Charles Kundahl
Harry Franklin Coffman, II	Etta Carolyn Link
Frank Concilus	Robert Hamilton Longwell
Sybil Corbett	Irving Robert Lowitz
Matthew Mordica Cox	Louis Ottone Joseph Manganiello
Warren Eugene Crane	Frank Sebastian Marino
William Ward Currence	Robert Mazer
Thomas Eugene Davies	James Nathaniel McCosh, Jr.
José G. Davila-Lopez	Malcolm Thomas McGoogan, Jr.
John Russell Davis, Jr.	John James Meli
Newland Edward Day	Edgar Allen Miller, Jr.
Karl Anton Dillinger	Robert Abram Moses
Philip Lafayette Dixon, Jr.	George Roy Mullins, Jr.
Richard Cushing File	Caesar Francis Orofino
John Howard Franz	John Carlton Osborne
Marion Friedman	Patrick Carey Phelan, Jr.
José Rodriguez Fuertes	Otto Charles Phillips
Joseph Charles Furnari	Dale Morton Posey
Jewett Goldsmith	William Thomas Raby
Arthur Edward Gramse	Edward Peyton Ritchings
Exie Mildred Gregory	John David Rosin
Morton Leonard Hamburger	Anthony Peter Rousos
Prevost Hubbard, Jr.	Henry Harrison Sadler, Jr.
Albert Lester Ingram, Jr.	Wallace Hyman Sadowsky

Isadore Sborofsky
Joseph Whiddon Scott
Mary Louise Lyons Scholl
Williams Jeffress Senter
Edgar Roderick Shipley
Maurice Isaac Shub
Louis Harry Shuman
James George Stegmaier
Andrew Anthony James Summa

Francis James Townsend
Francis Willoughby Traynor
Joseph Wallace, Jr.
Charles Monroe Ward
Charles Herman Williams
Edgar Percival Williamson, Jr.
Edwin Andrew Zepp
Loy Miller Zimmerman

VII. AWARDING OF HONORS: H. BOYD WYLIE, M.D., *Acting Dean*

UNIVERSITY PRIZE GOLD MEDAL

Joseph Whiddon Scott

CERTIFICATES OF HONOR

Alexander Emmanuil Brodsky Joseph Gordon Bird
Patrick Carey Phelan, Jr. Etta Carolyn Link
Anthony Peter Rousos

The Dr. A. Bradley Gaither Memorial Prize of \$25.00 for the best work in
genito-urinary surgery during the senior year: Otto Charles Phillips.

VIII. ADMINISTERING OF HIPPOCRATIC OATH: LOUIS A. M. KRAUSE,
M.D., *Associate Professor of Medicine.*

IX. BENEDICTION: REV. BOYD R. HOWARTH, *Rector of the Memorial
Protestant Episcopal Church.*

X. THE RECESSION: *March of the Priests*, Mendelssohn.

THE MARSHALLS

Chief Marshall, THURSTON R. ADAMS, M.D.

JAMES G. ARNOLD, JR., A.B., M.D.

HERBERT E. REIFSCHNEIDER, A.B., M.D.

OTTO C. BRANTIGAN, B.S., M.D.

D. McCLELLAND DIXON, M.D.

COMMENCEMENT EXERCISES

MAY 30, 1942

Ritchie Coliseum, College Park

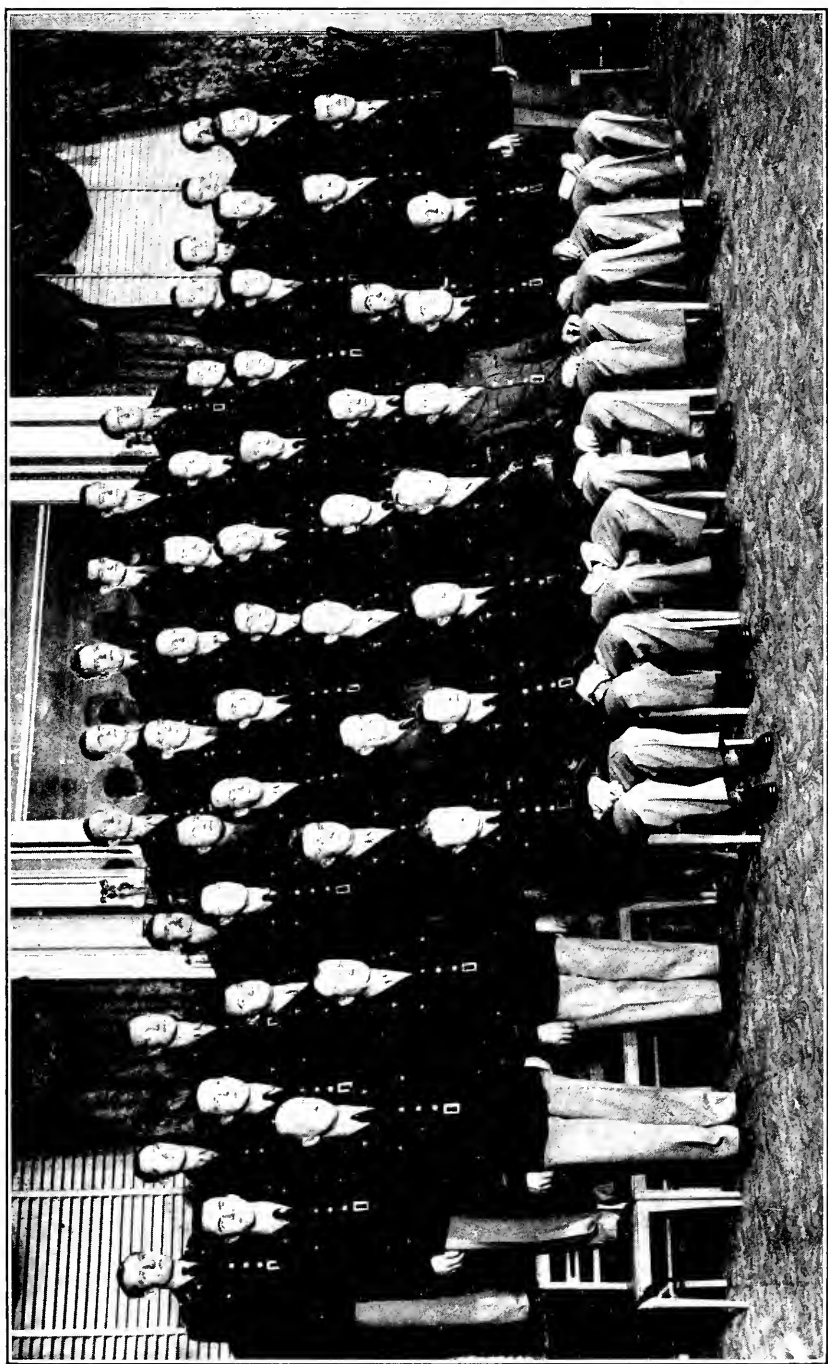
COMMENCEMENT PROGRAM

PROCESSIONAL MARCH—*Tannhauser*—Wagner.

The University of Maryland Band

Sergeant Otto Siebeneichen, *Director*

INVOCATION—RABBI SAMUEL M. SILVER, Director of the B'nai B'rith
Hillel Foundation, University of Maryland.



UNITED STATES ARMY HOSPITALS 42 AND 142

From left to right, first row, seated: Major Walter C. Merkel, Major H. Vernon Langeluttig, Major Monte Edwards, Lieut. Col. Maurice C. Pincoffs, Major George H. Yeager, Major Lewis P. Gundry, and Major Walter L. Kilby.

Second row from bottom: Major Robert B. Mitchell, Jr., Major Murray M. Copeland, Major Henry F. Ullrich, Major Samuel T. Helms, Major Harry C. Hull, Major H. Whitman Newell, Major Thomas J. Coonan, Major Simon H. Brager, Major Howard B. Mays, and Lieut. C. C. Fitzpatrick.

Third row: Lieut. James R. Karns, Lieut. Edwin O. Daue, Capt. Samuel H. Bryant, Capt. Arthur G. Siwinski, Capt. Lauriston L. Keown, Capt. Harry C. Bowie, Capt. D. James Greiner, Major Brice M. Dorsey, Lieut. Douglas A. Browning, Lieut. John Cronin, Capt. B. Wallace Inman, Capt. Theodore A. Schwartz, and Lieut. Benjamin Allen.

Fourth row: Capt. Frederick W. Waknitz, Lieut. Carl A. Bailey, Lieut. Everett S. Diggs, Capt. Francis G. Dickey, Capt. W. Kennedy Waller, Capt. William G. Helfrich, Capt. Walter E. Karigin, Capt. Robert C. Crawford, Capt. Stuart G. Coughlan, Capt. George H. Brouillet, Capt. Edward F. Cotter, Lieut. Edward J. Streidl, Lieut. S. Edwin Muller, and Lieut. Ephraim T. Lisansky.

Top row: Lieut. Frederick J. Vollmer, Lieut. Robert B. Mearns, Capt. William B. Long, Lieut. J. King B. E. Seegar, Jr., Lieut. Henry Rigdon, and Lieut. George F. Pollack.

GREETINGS—HIS EXCELLENCY, HERBERT R. O'CONOR, Governor of Maryland.

MUSIC—*My Maryland*—Audience.

Professor Harlan C. Randall, *Director*

ADDRESS—"The Absolute in Democracy," RIGHT REVEREND MONSIGNOR FULTON J. SHEEN, Professor of Philosophy, The Catholic University of America.

MUSIC—*America*—Audience.

CONFERRING OF DEGREES, CERTIFICATES AND COMMISSIONS—PRESIDENT H. C. BYRD.

PRESENTATION OF COMMISSIONS—MAJOR GENERAL FRANK E. LOWE.

MUSIC—*The Star Spangled Banner*—The University of Maryland Band.

BENEDICTION—RABBI SAMUEL M. SILVER.

RECESSIONAL MARCH—*Semper Fidelis*—Sousa.

REUNIONS

CLASS OF 1937 OF THE SCHOOL OF MEDICINE, UNIVERSITY OF MARYLAND

The following members of the Class of 1937 were present for their fifth reunion:

Drs. Joseph Cocimano, Samuel Jackson, Richard S. Owens, Elton Resnick, Martin H. Robinson, Norman E. Sartorius, C. P. Scarborough, George J. Weems, Thomas V. D'Amico, Helen Llewelyn, and Thomas G. Abbott.

A get-together was held before the annual banquet of the Medical Alumni Association. Dr. Thomas G. Abbott was in charge of all arrangements for the reunion.

CLASS OF 1927 OF THE SCHOOL OF MEDICINE, UNIVERSITY OF MARYLAND

The fifteenth reunion of the Class of 1927 was attended by sixteen members from Baltimore and out-of-town. Dr. A. H. Finkelstein was chairman for the occasion and arranged a program which included a meeting preceding the Medical Alumni Association banquet on May 28. Those present were:

Drs. John M. Bankhead, Silver Spring, Md.; William W. Chase, Washington, D. C.; Harry V. Davis, Chesapeake City, Md.; Francis B. Teague, Martinsville, Va.; William G. Totterdale, Warren, Ohio; Claude T. Whittington, Greensboro, N. C.; Bernard, J. Cohen, E. Eugene Covington, T. Nelson Carey, Harold M. Eliason, A. H. Finkelstein, Francis W. Gillis, Fayne A. Kayser, B. K. Lenson-Lambros, Frank K. Morris, and Herbert Reifschneider of Baltimore.

CLASS OF 1922 OF THE SCHOOL OF MEDICINE, UNIVERSITY OF MARYLAND

Twenty-four of the fifty-four members of the Class of 1922 were present at their twentieth reunion. A private get-together was arranged by Dr.

John A. O'Connor, who was in charge of arrangements, after which the members attended the annual banquet of the Medical Alumni Association.

CLASS OF 1917 OF THE SCHOOL OF MEDICINE, UNIVERSITY OF MARYLAND

The twenty-fifth reunion of the Class of 1917 was held on Thursday, May 28, 1942. Dr. Frank Ogden was chairman for the occasion and arranged a get-together at the Lord Baltimore Hotel preceding the annual banquet held there. Those who attended were:

Drs. Charles H. Audet, Waterbury, Conn.; Louis J. Bohl and Allan W. MacGregor, Paterson, N. J.; O. B. Bonner, High Point, N. C.; James Holmes, Springfield, Mass.; L. A. Lasher, Erie, Pa.; Marvin Porterfield, Martinsburg, W. Va.; Max Silverstein, Asbury Park, N. J.; Albert Stein, Thompsonville, Conn.; George Vaughan, Wilmington, Del.; Robert Welch, Annapolis, Md.; Roy Wolford, Washington, D. C.; Fred Bampffield, I. P. Bronushas, Harry Carroll, Fred Clark, Louis A. M. Krause, Kenneth Legge, Frank Ogden, H. Whitney Wheaton, and H. Lawrence Wheeler of Baltimore.

CLASS OF 1912 OF THE SCHOOL OF MEDICINE, UNIVERSITY OF MARYLAND

Under the chairmanship of Dr. M. L. Lichtenberg, the Class of 1912 held its thirtieth reunion on May 28 and 29. In spite of the rationing of gasoline and other unusual wartime conditions the attendance was larger than anticipated. The following out-of-town alumni were present:

Drs. Daniel H. Lawler, Hammond, Ind.; Harry H. Rich, Newark, N. J.; W. Howard Yeager, Hagerstown, Md.; Edward C. Straessley, Beaver Falls, Pa.; Everett A. Livingston, Gibson, N. C.; Benjamin Newhouse, Washington, D. C.; Dawson George, Denton, Md.; Lieut. Col. Harry A. Bishop, Washington, D. C.

There was 100 per cent attendance of the local members of the class:

Drs. David Silberman, Bertrand Lillich, Ernest Frey, Edward Johnson, Edward A. Looper, C. Loring Joslin, John Traband, Harry Deibel, John Skladowsky, Charles Clautice, Thomas Stevens, William Michel, and M. L. Lichtenberg.

Besides attending the banquet of the Medical Alumni Association, a dinner for the Class of 1912 only was held on May 29 at the Southern Hotel. Plans were made for the thirty-fifth reunion and the local men arranged to get together every year. It is worthy of note that this class has never missed a five-year reunion since graduation.

CLASS OF 1912 OF THE COLLEGE OF PHYSICIANS AND SURGEONS

Before attending the annual banquet on May 28th the following members of the Class of 1912, College of Physicians and Surgeons, were entertained at the home of Dr. Albert E. Goldstein:

Drs. George A. Kohler, Jr., Smithsburg, Md.; Alonzo W. Little, Jr., Jersey City, N. J.; Harry M. Biffar, Flushing, N. Y.; Earl Thompson, Milwaukee, Wis.; S. J. Roberts,

Harrisburg, Pa.; L. O. Schwartz, Weirton, W. Va.; Grover Sweet, Rocky Hill, Conn.; Joseph Brown, Lewistown, Pa.; Edward P. Smith and Albert E. Goldstein of Baltimore.

A program of sightseeing and entertainment was arranged by Dr. Edward P. Smith, and those who participated were disappointed that more members of their class could not join them in their festivities. It is planned to hold annual reunions in the future in order to keep the members in closer touch with each other.

CLASS OF 1902 OF THE COLLEGE OF PHYSICIANS AND SURGEONS

Dr. J. Morley Hoag was in charge of arrangements for the fortieth reunion of the Class of 1902, College of Physicians and Surgeons. A sightseeing tour in and around Baltimore was arranged in addition to the other activities planned for the alumni. Those who attended were:

Drs. John H. Doyle, Fall River, Mass.; A. B. Headley, Cambridge, Ohio; C. B. Meserly, Martins Ferry, Ohio; A. P. Traywick, Cameron, S. C.; Clarence J. Bell, Wellfleet, Mass.; Dwight P. Cruikshank, Lumberport, W. Va.; Alfred Ullman and J. Morley Hoag of Baltimore.

The following members of the Class of 1903, College of Physicians and Surgeons, joined the Class of 1902 in their reunion:

Drs. T. Richard Paganelli, New York City; C. W. Lurting, Pittsburgh, Pa.; George Sargent, Towson, Md.; Edgar B. Friedenwald of Baltimore.

THE 135TH ANNUAL BANQUET

The 135th Annual Banquet of the Medical Alumni Association of the University of Maryland was held on May 28, 1942 at the Lord Baltimore Hotel, Baltimore. The speakers on the program were:

Dr. H. C. Byrd, President of the University of Maryland

Dr. Harvey B. Stone, Guest Speaker

Dale M. Posey, President of the Senior Class, Presentation of the University of Maryland Graduating Class Perpetual Loan and Scholarship Fund

Dr. H. Boyd Wylie, Acting Dean of the School of Medicine

Lt. Col. Walter D. Wise, M.C., Toastmaster

In addition, the following were guests of honor:

President H. C. Byrd

His Excellency Herbert R. O'Connor, Governor of Maryland

The Honorable Howard W. Jackson, Mayor of Baltimore

Members of the Board of Regents

Graduates of the Class of 1887

Graduates of the Class of 1942

REGISTRANTS FOR SPRING ACTIVITIES

The following Alumni registered during the Spring Activities:

Drs. John P. Hall, Pittsburgh, Pa.; G. Orbin Hall, Murrys ville, Pa.; Lemuel Ely, Chuckatuck, Va.; A. B. Headley, Cambridge, Ohio; C. B. Messerley, Martin's Ferry, Ohio; C. J. Bell, Wellfleet, Mass.; William Ginsburg, New York City; Herbert Gordon, New York City; Aaron Trynin, Brooklyn, N. Y.; H. M. Sternberg, Brooklyn, N. Y.; William Hollister, New Bern, N. C.; Albert Stein, Thompsonville, Conn.; O. B. Bonner, High Point, N. C.; James Holmes, Springfield, Mass.; Bernard Goldmann, Pittsburgh, Pa.; J. D. Rudisill, Lenoir, N. C.; George Keefe, Hartford, Conn.; Samuel Sweet, Utica, N. Y.; C. D. Marchant, Harmony Village, Va.; William D. Huff, Roanoke, Va.; Harry Goldsmith, Quantico, Va.; J. Henry Orff, Shillington, Pa.; E. A. Livingston, Gibson, N. C.; W. G. Totterdale, Warren, Ohio; A. W. Valentine, Washington, D. C.; John H. Doyle, Fall River, Mass.; Thomas V. D'Amico, Verona, N. J.; Harry Biffar, Flushing, N. Y.; Wm. J. B. Orr, Washington, D. C.; D. H. Lawler, Hammond, Ind.; B. M. Rhodes, Tallahassee, Fla.; L. O. Schwartz, Weirton, W. Va.; H. H. Rich, Newark, N. J.; E. C. Straessley, Beaver Falls, Pa.; H. B. McDonnell, College Park, Md.; F. B. Teague, Martinsville, Va.; Dawson George, Denton, Md.; Henry P. Talbot, West Hartford, Conn.; M. H. Porterfield, Portsmouth, Va.; H. V. Davis, Chesapeake City, Md.; D. P. Cruikshank, II, Lumberport, W. Va.; C. W. Lurting, Pittsburgh, Pa.; W. Howard Yeager, Hagerstown, Md.; H. C. Bridgers, Blue Ridge Summit, Pa.; George H. Stewart, Ottoman, Va.; Charles R. Foutz, Westminster, Md. Drs. Edgar B. Friedenwald, W. R. Johnson, John T. Cole, Margaret Ballard, J. Morris Reese, M. L. Lichtenberg, F. W. Gillis, Daniel Bogorad, A. H. Finkelstein, H. L. Wheeler, Byruth Lenson-Lambros, Louis H. Douglass, C. Loring Joslin, J. G. O'Brien, J. Morley Hoag, J. E. Savage, Milton S. Sacks, John A. Wagner, Herbert E. Zepp, Cyrus F. Horine, Thomas B. Aycock, John Evans, Louis C. Dobihal, E. William Frey, Charles P. Clautice, Dwight P. Cruikshank, III, H. Whitney Wheaton, William Michel and Harvey G. Beck of Baltimore.

ITEMS

The Department of Pharmacology has received a grant of \$3500 from the International Cancer Foundation of Philadelphia to continue its studies on the fundamental problem of cancer metabolism. This is the fourth of several grants received from this foundation. In addition, a grant of \$3500 has been received from the Ohio Chemical and Manufacturing

Company of Cleveland to further the studies on volatile anesthetics. This is the fifth grant from the Ohio Chemical and Manufacturing Company.

Dr. Henry Wigderson (U. of Md. 1931) has been assigned to the post of medical director at the Neurologic Hospital established by Hadassah in Jerusalem, Palestine. He has been occupying the post since about December 25, 1941 and is scheduled to remain there for three years.

Dr. Nathan Rudo (U. of Md. 1934) has been commissioned Lieutenant (j.g.), MC-V (S) in the U. S. Naval Reserve.

Dr. Arthur M. Shipley, Professor of Surgery, spoke on "Traumas of the Chest" at the meeting of the Maryland Academy of Medicine and Surgery which was held on April 21, 1942. On the same program Dr. Emil Novak, Associate Professor of Obstetrics, read a paper on "Newer Developments in Gynecologic Endocrine Therapy."

Dr. Isadore E. Gerber, Class of 1926, has moved his office to 111 East 75th Street, New York City.

ACTIVITIES OF THE CORDELL HISTORICAL SOCIETY OF THE UNIVERSITY OF MARYLAND, 1941-1942

Because of the duress of war activities and the acceleration of the medical course, the Cordell Historical Society held only one meeting this year. On April 29, 1942 the Society was host to the members of the Third Graduate Week in Medical History at the Institute of the History of Medicine of the Johns Hopkins University. Dr. John C. Krantz, Jr., president of the Society, conducted the meeting which was held in Chemical Hall of the University of Maryland at 8:30 P.M.

Dr. Howard J. Maldeis, chief medical examiner of the State of Maryland, discussed "The History of the Medical Examiner's System," and concluded with an interesting resumé of the changes made in the State of Maryland in 1939 when the coroner system was abolished and the medical examiner system substituted in its place. The second speaker, Dr. John E. Savage, Associate in Obstetrics and Assistant in Pathology at the School of Medicine, University of Maryland, spoke on "William Hunter and His Magnum Opus." Dr. Savage had on display his own copy of Hunter's "Anatomy of the Human Gravid Uterus" which was the center of attraction after the meeting. While refreshments were being served the guests examined the exhibit of books from the Medical Library which had been set up in Chemical Hall for this particular occasion. There were

rare and historical works illustrating the subject "From Midwifery to Obstetrics," many of which had been loaned to the library from the personal collection of Dr. Savage. Both addresses delivered before the Cordell Historical Society will be published in the *Bulletin of the School of Medicine, University of Maryland*.

The Cordell Historical Society sponsored another series of lectures on the history of medicine by Dr. Louis A. M. Krause, Associate Professor of Medicine. Dr. Krause lectured on "The History of Scourges" during the 1941-1942 school year. These Tuesday afternoon talks were received with much enthusiasm by the students, for whom they were primarily intended, and many others who had long been aware of Dr. Krause's reputation as a public lecturer.

The Cordell Historical Society as a constituent member of the national organization, the American Association of the History of Medicine, is entitled to send its delegate, Dr. John C. Krantz, Jr., to the annual meeting in Atlantic City each spring. Unable to attend this year, Dr. Krantz authorized Miss Julia E. Wilson, secretary of the Society, to vote as his delegate and give the report of the Society before the council of the national organization.

OBITUARIES

- Arthur, William Elmo**, Cardiff, Md.; class of 1892; aged 74; died, January 2, 1942, of cerebral hemorrhage.
- Booth, William Gillmore**, Seattle, Wash.; B.M.C., class of 1898; aged 81; died, February 6, 1942, of chronic myocarditis and pneumonia.
- Brewer, George Millward**, Plumsteadville, Pa.; class of 1910; aged 56; died, January 11, 1942 in St. Petersburg, Fla., of cerebral hemorrhage.
- Douglass, James E.**, Tarpon Springs, Fla.; P. & S., class of 1873; aged 90; died, March 1, 1942, of chronic myocarditis and valvular heart disease.
- Elmore, William Lewis**, Frankfort, Ky.; P. & S., class of 1883; aged 85; died, January 11, 1942.
- Flowers, Arthur O.**, Clarksburg, W. Va.; P. & S., class of 1891; aged 78; died, February 5, 1942, of acute peritonitis.
- Fredlock, Armistead Montgomery**, Elkins, W. Va.; class of 1889; aged 75; died, February 15, 1942.
- Gallagher, Frank M.**, Columbus, O.; P. & S., class of 1901; aged 70; died, January 16, 1942, of coronary occlusion.
- Guistwhite, Bruce**, Cumberland, Md.; class of 1914; died, June 3, 1942.
- Harris, Charles Boarman**, Pembina, N. D.; P. & S., class of 1880; aged 84; died, January 2, 1942, of arteriosclerosis and heart disease.
- Henry, William T.**, Stevensville, Md.; P. & S., class of 1896; aged 72; died, January 25, 1942, of hemiplegia.
- Holroyd, Samuel R.**, Athens, W. Va.; P. & S., class of 1890; aged 73; died, January, 1942, of diabetes mellitus.
- Houston, William Humes**, Lt. Col., U. S. A., retired, Key West, Fla.; class of 1900; served during the World War; aged 66; died, March 20, 1942.
- Hudson, John Harvey**, Vanceboro, N. C.; P. & S., class of 1907; aged 64; died in March, 1942, of injuries received in an automobile accident.
- Hunter, Henry John**, Ilion, N. Y.; B.M.C., class of 1890; aged 73; died, January 2, 1942, of cerebral hemorrhage.
- Iddings, Charles M.**, Brookville, Md.; class of 1888; aged 81; died, in February, 1942, of cerebral hemorrhage and arteriosclerosis.

- Kingsbury, Dana W.**, Nanticoke, Pa.; P. & S., class of 1882; aged 89; died, February 8, 1942, of arteriosclerotic heart disease.
- LaRiew, Frederick Jackson**, Washington, N. J.; B.M.C., class of 1898; aged 74; died, January 6, 1942, of arteriosclerosis and coronary occlusion.
- Maker, Maca Gilbert**, Fall River, Mass.; B.M.C. class of 1909; aged 56; died, March 2, 1942, in Providence, R. I.
- Maybank, Joseph**, Charleston, S. C.; class of 1889; aged 72; died, January 2, 1942.
- Miller, Benjamin Edgar**, New Smyrna Beach, Fla.; P. & S., class of 1892; aged 70; died, December 21, 1941.
- Moomau, Glenn**, Petersburg, W. Va.; P. & S., class of 1904; aged 61; died of coronary occlusion.
- Moore, Howard Riely**, Charles Town, W. Va.; P. & S., class of 1883; aged 80; died, January 10, 1942.
- Moseley, Charles W.**, Greensboro, N. C.; B.M.C., class of 1893; aged 76; died, March 12, 1942, of pneumonia.
- Mowers, Joseph Henry**, Shippenburg, Pa.; class of 1878; aged 87; died, February 7, 1942.
- Nicholls, Walter Lee**, Birmingham, Ala.; P. & S., class of 1902; aged 64; died, March 31, 1942, of coronary occlusion.
- Osincup, Charles Hiram**, Colorado Springs, Colo.; B.M.C., class of 1891; aged 79; died recently of chronic myocardial disease.
- Reid, George Clute**, Rome, N. Y.; B.M.C., class of 1902; aged 63; died, January 8, 1942, in Palm Springs, Calif., of multiple myeloma.
- Riordan, William Joseph**, Wallingford, Conn.; B.M.C., class of 1909; aged 56; died in March, 1942.
- Rowan, Patrick John**, Pittsburgh, Pa.; P. & S., class of 1885; aged 81; died, November 19, 1941, of coronary thrombosis and arteriosclerosis.
- Silver, Morris D.**, Detroit, Mich.; P. & S., class of 1902; aged 61; died, April 26, 1942.
- Smith, S. D.**, Byron, Ga.; P. & S., class of 1882; aged 85; died, January 3, 1942, of bronchopneumonia.
- Stifler, William Curtis**, Baltimore, Md.; P. & S., class of 1905; aged 69; died, February 17, 1942, of cerebral hemorrhage.
- Stockton, Walter Irving**, Silver City, N. C.; P. & S., class of 1914; aged 51; died, January 16, 1942.
- Taylor, Clifford Morrison**, Westminster, Md.; class of 1933; aged 39; died, March 25, 1942.
- Teague, Jesse Herbert**, Laurens, S. C., class of 1900; aged 69; died, January 5, 1942, of staphylococcic septicemia.

Walker, Rome Howard, Charleston, W. Va.; P. & S., class of 1914; served during the World War; aged 53; died, February 19, 1942, of sarcoma.

Webster, Albert George, Baltimore, Md.; class of 1911; aged 56; died, December 20, 1941, of carcinoma of the colon.

Williams, Jesse Frank, Clarksburg, W. Va.; B.M.C., class of 1908; aged 60; died, March 18, 1942, of coronary thrombosis.

BULLETIN

OF THE

SCHOOL OF MEDICINE

UNIVERSITY OF MARYLAND

Vol. 27

OCTOBER, 1942

No. 3

THE INDISCRIMINATE USE OF PURGATIVES IN CONSTIPATION*†

HARVEY G. BECK, M.D. AND LOUIS J. KROLL, M.D.

BALTIMORE, MD.

Man has an inborn craving for medicine. The desire to take drugs is one feature which distinguishes man, the animal, from his fellow creatures. It is really one of the most serious difficulties to be overcome. With the diminished reliance upon remedies there has been a return with profit to the older measures of diet, exercise, baths, and frictions. The foregoing statements are excerpted from Osler's writings and apply with special force to the subject under consideration.

With regard to the use and abuse of drugs in constipation, Wright in his "Quackery in Medicine" expresses his opinion of the present status in the following paragraph:

"We have too frequently, and what candid man has not, seen cathartics prescribed when they were decidedly indicated, and repeated until all the good they could do had been done, and then continued until the disease they had been intended to relieve had been aggravated, or one of a worse character induced. Purging is many times continued until a subacute enteritis is induced or aggravated, and the abdomen becomes painful and distended. And then it is still further continued, under an erroneous impression that a new disease has occurred. Thus the patient is finally purged out of existence, without the doctor once suspecting the possibility that he may be wrong, or that something else or some other treatment, would be advisable."

Boas (1) reported that constipation is mild at the onset but that later the intestine becomes sluggish, although the patient attaches little importance

* From the Department of Medicine, School of Medicine, University of Maryland.

† Received for publication August 17, 1942.

to this until by degrees the necessity for relief causes a resort usually to purgatives and more rarely to injections. As the former gradually lose their effect, more cathartics are employed and the condition is thus carelessly allowed to continue year in and year out. Finally, all remedies become inactive and the pain and catarrhal phenomena necessitate rational and comprehensive interference.

Hurst (2) asserted that the majority of cases of constipation can be cured without drugs if proper treatment is instituted at a sufficiently early stage. He considered it unwise to prescribe purgatives to every patient who complains of constipation. Instead, the cause and nature of the constipation should first be ascertained, and drugs should only be given for certain definite indications. Furthermore, he added, "I sometimes wonder whether the colon is not more sinned against than sinning, for what with attacks from above by purges, attacks from below with douches, and frontal attacks by the surgeon, its sorrows are numerous and real."

According to Leslie (3), the indiscriminate use of the numerous aperient remedies is directly opposed to the modern view of rational therapeutics. In order to prevent intestinal stasis purgative drugs should be avoided (4, 5).

Lethbridge (6) under the facetious caption of "Aperientitis" avowed it was an increasingly growing and ever raging pandemic. He considered that the harm done by aperients grossly outweighed the good effects, and emphatically asserted that they were the greatest cause in humans of so-called constipation.

To quote Goodman and Gilman (7), "There are only a few instances in which the use of cathartics is indicated; contrary to popular belief, chronic constipation does not constitute one of them. The continual use of cathartics is a most harmful practice and may provide the basis for serious gastrointestinal disturbances including spastic colitis, dyspepsia, reflex gastric complaints and many functional ills."

Many more references could be cited that express the same general opinion with regard to the injurious effect of purgatives when habitually employed, an opinion fully in accord with clinical observation. At the same time, the generally accepted view is shared that purgatives as a class of drugs are indispensable and serve a most useful purpose in selected cases in which they are definitely indicated.

Unfortunately, as a result of overemphasis and misconception the lay mind has become obsessed with popular fallacies relating not only to constipation, but also to the need of vitamins and hormonal stimulation. This has led to much abuse of these remedies and caused the impairment of health in many instances.

These concepts relating to constipation are not new, for, twenty-three

centuries ago Hippocrates wrote in one of his aphorisms: "Persons in good health quickly lose their strength by taking purgative medicines." He resorted to whole meal bread as a laxative food. Celsus said, "Physic is not always good for the sick but is always hurtful to the healthy." He advised drinking large amounts of hot water as a laxative. Asclepiades was opposed to the use of violent remedies and especially condemned the excessive use of purgatives and enemas. He introduced music as a soothing agent and advised frequent bathing and massage.

Thus, the basic principles upon which modern rational therapy depend for treatment of constipation were established many centuries ago by the great masters in medicine. They emphasized the detrimental results of the injudicious use of purgatives, the harmful effects of enemas, the importance of suitable diet, the value of plenty of fluids, the benefit of hydrotherapy (baths), physiotherapy (massage), and psychotherapy (music).

As in all other matters relating to medicine, the doctrine of purgation was shrouded in mystery and superstition and was governed largely by astrologic phenomena, a practice dating back to the earliest periods of civilization.

Despite the wise precepts of Hippocrates and the others mentioned, superstition continued to prevail throughout many centuries. Vestigial evidence is still extant in certain forms of almanacs published annually, with forecasts based on the astrologic signs of the zodiac.


According to Sudhoff (8), the earliest printed document relating to medicine was the unique "Purgation Calendar" (*Laxierkalender*) published in 1457 and printed in the type of Gutenberg's 36 line Bible (Plate I, translation p. 73).

A somewhat similar calendar for bloodletting (*Aderlasskalender*) was published at Mainz in 1462. These calendars were the forerunners of the druggist almanacs which have been so much in vogue since then.

Medico-astrologic superstitions became legalized and astrology was treated as a special science. Textbooks on astrology obtained publicity in large numbers beginning with the fourteenth century and influenced the minds and actions of many of the leading men in the profession. Physicians were supposed to be well informed in astrologic science.

If faith and superstition are twin brothers, as has been quoted, it is self-evident that many of the so-called faith cures had their origin in superstition.

The faith required to accept and practice some of the mystic theosophic doctrines as taught by a certain sect of the Essenians is almost incredulous. It was believed that man by the evacuation of feces offered an insult to divinity (Josephus, lib. 2, chap. VIII, no. 9, par. 15). For that reason they were to abstain from having a bowel movement on the Sabbath, and on weekdays to conceal the act from the view of the Supreme Being by


 Coniunctio et oppositio solis et lune ac minoris ete ete nec nō dies p medicis
 laxativa lumentis In anno dñi Mccc lxxv b lēa dñicalis xiiii aure? nūc
 Inrevallū iē ebdomide Coniunctio una dies
 Oppositio scia scōa p' ethardi hora iē p' meridiē ~~hæc~~ in die Coniunctio
 pauli hora v post meridiē Minutiones scia scōa et recta post Coniunctio dñi
 laxativa lumentis iē x xvi xix xē xē vii ac vicissim nono die hui? mensis
 Oppositio die apollonie hora xi an meridiē ~~hæc~~ die machie apli hora v an
 meridiē Minutores sabbo et dñica p' apollonie v et vi p' valēni et vi p' machie
 laxativa lumentis v vi vii xvi xvi xē xē vii ac xē v die huius mensis
 Oppositio scia quia an gregori hora xi p' mēdie ~~hæc~~ annūciatio mā-
 rie hora sexta post meridiē Minutores pñdie et die gertrudis et dñica p' gertrudis
 laxativa lumentis iii v vi xvi xvi xē xē vii ac xē v die huius mensis
 Oppositio sabbo post ambrosij in mēdie ~~hæc~~ calistino gregori hoā sexta
 an mēdiem Minutores scōa p' ambrosij pñdie et die cyburgij dñica et scia scōa p'
 cyburgij laxativa lumentis i iii x xii xix xē xē xē vii xē xē ac xē die h' mēdis
 Opō scōa p' goshiardi in media nocte ~~hæc~~ scōa an urbani hoā vi p' mēdis
 Minutores die goshiardi et die sequē die gordiani et die sequē pñdie sophie et die
 mēdiem laxativa lumentis vii vii x xvi xvi xē xē vii ac xē vii die h' mēdis
 Oppositio scia post bonifacij hoā pñma p' mēdiē ~~hæc~~ quā post albani
 hoā vii an mēdis Minutores quā et v an bonifacij et sabbo p' bonifacij v et vi
 anre albani laxativa lumentis iii vii xvi xvi xē xē vii ac xē vii die h' mēdis
 Oppositio quā p' valēni hoā xi p' mēdiē ~~hæc~~ pñdie marie magdal hoā v p'

TRANSLATION OF PLATE I

Conjunctions and oppositions of sun and moon, preferable days for bloodletting and the days on which laxatives should be taken in the year of the Lord 1457 whose *littera dominicalis* is b and the golden number XIV. The *interval*, i.e., between Christmas and Lent, is nine weeks. The *concurrentes* are one day.

January Opposition on the Monday after Erhardus' day at 9 p.m. Rising of the new moon on the day after Paul's conversion at 5 p.m. Bloodletting on Monday and Tuesday after Christ's circumcision. Laxatives should be taken on the 9th, 10th, 11th, 18th, 19th, 20th, 28th, and 29th of this month.

February Opposition on the day of Apollonia at 11 a.m. Rising of the new moon on the day of the apostle Matthew at 5 a.m. Bloodletting on the Saturday and Sunday after Apollonia's day, on the 5th and 6th after Valentine's day, and on the 3d after Matthew's day. Laxatives should be taken on the 5th, 6th, 7th, 14th, 15th, 16th, 23d, 24th, and 25th of this month.

March Opposition on the Thursday before Gregory's day at 11 p.m. Rising of the new moon on the Annunciation of Mary at 6 p.m. Bloodletting on the day before and Gertrude's day and on the Sunday after Gertrude's day. Laxatives should be taken on the 4th, 5th, 6th, 13th, 14th, 15th, 23d, 24th, and 25th of this month.

April Opposition on the Saturday after Ambrose's day at noon. Rising of the new moon on the day after George's day at 6 a.m. Bloodletting on the 6th day after Ambrose's day, on the day before and Tiburtius' day, and on the Sunday and Monday after Tiburtius's day. Laxatives should be taken on the 1st, 2d, 3d, 10th, 11th, 12th, 19th, 20th, 21st, 28th, 29th, and 30th of this month.

May Opposition on the second day after Gotthard's day at midnight. Rising of the new moon on the second day before Urban's day at 6 p.m. Bloodletting on Gotthard's day and the day after, on Gordianus' day and the day after, on the day before Sophia's day and on Sophia's day. Laxatives should be taken on the 7th, 8th, 9th, 16th, 17th, 18th, 25th, 26th, and 27th of this month.

June Opposition on the third day after Boniface's day at 1 p.m. Rising of the new moon on the fourth day after Alban's day at 7 a.m. Bloodletting on the 4th and 5th day before Boniface's day, on the 6th day and the Saturday after Boniface's day and on the 5th and 6th day before Alban's day. Laxatives should be taken on the 3d, 4th, 5th, 13th, 14th, 15th, 22d, 23d, and 24th of this month.

Opposition on the fourth day after Udalric's day at 11 p.m. Rising of the new moon on the day before Mary Magdalene's day at 5 p.m. (rest missing).

Translation by Dr. O. Temkin.

FRAGMENT OF PURGATION CALENDAR (LAXIERKALENDER) (PRINTED IN 1457)

covering themselves with a cloak. Thus, not only too much reliance on drugs but also superstitions were factors responsible for the slow progress in the scientific management of constipation.

CLINICAL OBSERVATIONS

The clinical observations in this article are based on the study of a consecutive series of 8635 cases, of which 1774 or 21 per cent suffered from chronic constipation. For convenience they are grouped into the three commonly recognized forms or stages: (1) atonic, (2) catarrhal, (3) spastic. There is a miscellaneous group in which the form is not designated. Most of these, however, are either catarrhal or a combination of catarrhal and spastic: atonic, 27 cases; catarrhal, 104 cases; spastic, 937 cases; miscellaneous, 706 cases.

The chronic nature and form of constipation were established on the basis of duration, symptomatology, laboratory studies including roentgenograms, and the habitual use of laxatives, strong purgatives or enemas. During the first or atonic stage individuals are free from symptoms, except for infrequent and sluggish bowel movements. As a consequence, a physician is not consulted, but instead the patients resort to the promiscuous use of laxative drugs so easily available in palatable form. This soon becomes a daily habit which supersedes all rational corrective therapeutic measures, including diet, exercise, and the development of regular time to answer nature's call.

By the continuous and indiscriminate use of purgatives in atonic constipation, the secondary or catarrhal stage ultimately develops. This may not occur for a period of many years or even decades, except in neuropathic individuals in whom the condition develops earlier. In this stage patients complain of flatulence with abdominal distention, especially after gas-producing foods. A characteristic feature is that these foods or purgatives cause no pain. The distinctive feature of the stool is the presence of mucus which often envelops the scybala.

If proper measures with respect to the diet, habit, and medicinal management are not instituted, the condition will develop in a comparatively short time into the third or spastic stage, which is characterized by both pain and flatulence. These symptoms are aggravated by coarse food, purgatives, and enemas. The pain may be caused by mucus or flatulent colic. The sigmoid, which can usually be palpated, is cordlike, firm, and tender. The anal sphincters are spastic and contracted. As a rule, the rectum is empty and the stools are hard and knotted, small in caliber, and often contain free mucus which may be blood streaked. The colitis associated with the catarrhal stage is often the precursor of spastic constipation, in which it constitutes a major role. It is the combination of these two conditions which

gives rise to the distressing local and constitutional symptoms, often resulting in a state of chronic invalidism and disability. Unless the course of the disease is counteracted by the application of sound and rational therapeutic measures, it will progress and give rise to serious complications, such as spastic obstruction, colonic stasis, atonic dilatation, and toxic absorption, conditions which challenge the ingenuity and skill of the ablest physician in effecting a permanent cure.

It is in this advanced stage that severe nervous symptoms often develop. Many patients become markedly psychoneurotic. The Germans introduced the word *enterics* to designate the nervous and mental syndromes so frequently encountered in this group of cases. Among the outstanding symptoms are the lack of emotional inhibition, states of anxiety coupled with fears, doubts, chronic indecision, and obsessions. The patients become moody and often depressed, and complain of headaches, nervousness, palpitation, muscular pains, insomnia, weakness, and anorexia. As a result of anorexia, and in order to avoid gaseous distention and abdominal pain, they often refuse to eat certain meals, usually breakfast or lunch, and restrict their diet. This becomes wholly inadequate and imbalanced, results in vitamin and mineral deficiency, and accounts for the frequent loss in weight. Unfortunately, these cases are too frequently regarded as merely neurasthenic or psychasthenic. It is this group which represents the end results of the cathartic habit that will be emphasized especially. Thus constipation, through the abuse of purgatives, becomes organic in nature and therefore requires a thorough, comprehensive and well organized plan of treatment in contradistinction to functional constipation which is simple to correct if early recognized.

PHARMACOLOGY

The mechanism of action of the cathartic drugs, as outlined by Clark (9) and Goodman and Gilman (7), falls under three headings. They are classified as irritant cathartics, bulk cathartics, and emollient cathartics.

The irritant cathartics include many of the drugs most used in the treatment of constipation. They act by irritating the intestinal tract and increasing its motor activity. The drugs included are the emodin cathartics (cascara, senna, rhubarb, aloe); the resinous cathartics (jalap, colocynth, elaterin, podophyllin); irritant oil cathartics (castor oil, croton oil); and miscellaneous cathartics (phenolphthalein, mercurous chloride).

The bulk cathartics increase the contents of the intestinal tract and consist either of hydrophilic colloids and indigestible fiber, or of inorganic salts which because of slow absorption exert osmotic pressure sufficient to hold water in the intestinal tract. This group comprises the saline ca-

thartics, chiefly magnesium and sodium salts. Included among the hydrophilic colloids and indigestible fiber are agar, psyllium seed, and bran.

The emollient cathartics act through lubrication of the intestinal tract. This group includes liquid petrolatum and the vegetable oils.

Phenolphthalein deserves special mention for the reason that it has become one of the most popular remedies and, in selected cases if rationally applied, one of the most useful for constipation. It is administered either in pure form or in combination with other medicinal agents including the emollient cathartics. These compounds are usually palatable and readily available without a physician's prescription. The use of phenolphthalein has an irritating effect chiefly upon the large intestine, which produces motor stimulation with increased contractility and peristalsis. It also increases the flow of mucus and exerts its greatest effect on the colon. However, the movements of the small intestine are also increased. A part of the drug is absorbed and excreted in the bile, hence it will produce purgative effects for three or four days. It is considered a renal irritant by some pharmacologists and, though it is relatively nontoxic, in hypersusceptible individuals it may give rise to severe gastrointestinal symptoms or a well marked skin rash.

Although it is generally conceded that phenolphthalein causes no ill effects when given in small doses over brief periods, the continuous daily administration over indefinite periods may give rise to symptoms or aggravate existing conditions, such as colitis, intestinal spasticity, and stasis.

Soper (10) reported the result of his study of 177 individuals who daily employed phenolphthalein as a habitual laxative for from two to twenty-four months. He found that 152 persons in the group suffered from catarrhal colitis, three from chronic stomatitis, and that only twenty-two showed no signs of toxicity as a result of using the drug.

REPORT OF CASES

The abstracted case reports herewith presented are illustrative of forms of constipation which follow the prolonged and excessive administration of purgative drugs. They include various allied gastrointestinal conditions, as well as reflex and toxic phenomena which are often superinduced by chronic catharsis. The favorable response to rational therapy is also brought out by clinical observations and roentgen ray findings.

Case No. 1: A. B., age 53, a male teacher, complained of constipation and nervous and mental symptoms. In June, 1937 he developed an anxiety neurosis with depression, and was confined to bed for two months at his home. Later he was treated in several psychopathic institutions, in the last one for a period of seven months without definite improvement. For years he suffered from chronic valvular disease and constipation. During the past twenty years he took phenolphthalein periodically in some form or other.

The examination revealed, in addition to his cardiac lesion and psychosis, achylia gastrica, cardiospasm, chronic spastic colitis with constipation, cecal dilatation, dyschesia, right upper quadrant adhesions, and hemorrhoids. The basal metabolic rate was -18 per cent. The other laboratory findings were negative.

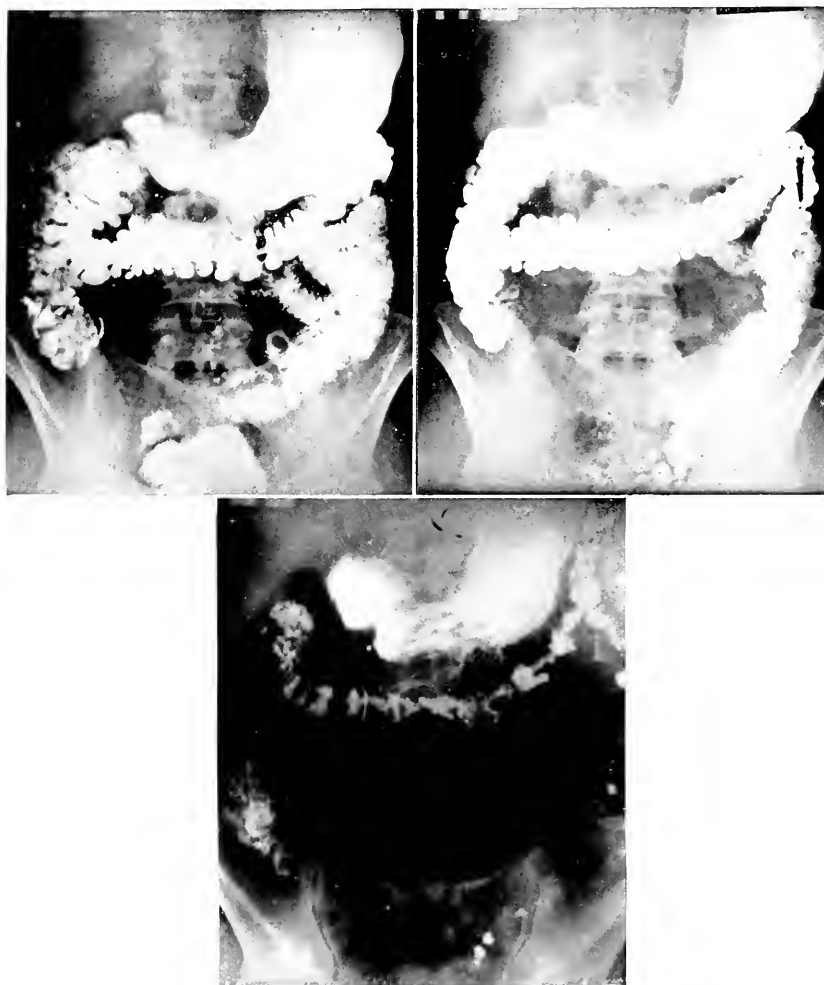


FIG. 1. (Upper left) Spastic colon with dilatation and right upper quadrant adhesions.

FIG. 2. (Upper right) Shows the improvement following treatment.

FIG. 3. (Lower) Severe spastic colitis resulting from the habitual use of strong purgatives for twelve years.

Treatment directed to the gastrointestinal disturbance not only relieved the constipation and associated intestinal conditions, but the mental symptoms subsided promptly. At his last examination the patient reported that his bowel movements were better than they had been for years, and that he required no purgatives or any other medicine.

Since the treatment, which consisted of bed rest, a laxative nonirritant diet, hot moist abdominal compresses, thyroid extract, antispasmodic drugs, and mineral oil, he has been free from mental symptoms and has been physically active. For the past two years he has resumed full charge of his duties as a university professor (Figs. 1 and 2).

Case No. 2: S. K., age 53, was a merchant whose chief complaints were constipation, nervousness, and mental depression.

For the past twelve years he had taken an emollient containing phenolphthalein regularly every other night. Except for epigastric distress, and hemorrhoids which were removed some years ago, he was singularly free from gastrointestinal manifestations. The outstanding symptoms were referable to his nervous system and included headache, dizziness, malaise, mental depression, irritability, insomnia, fears, flight of ideas, and lack of concentration. He was treated in several institutions for nervousness and mental depression without any apparent improvement.

An examination showed that he was suffering from gastric hyperacidity, chronic colitis with spastic constipation, and colonic stasis. On the usual dietetic and hygienic regime, with antispasmodic drugs and mineral oil, there was a rapid response with respect to relief from constipation and colitis, as well as from the nervous and mental symptoms. As a result, the patient resumed the business responsibilities which he had abandoned on account of ill health for over three years (Fig. 3).

COMMENT

Manifestations of nervous and mild mental disturbances are frequently observed in these severe cases of chronic constipation, especially if accompanied by stasis. One would naturally surmise that the relief of these symptoms was influenced by the relief of the intestinal condition including constipation.

Case No. 3: W. M., age 54 years, a housewife, complained of chronic constipation and indigestion of long duration. Purgative drugs were taken every other night for a period of years. These frequently caused abdominal cramps. Pyrosis, epigastric distress after meals, and eructations were prominent symptoms.

A gastric analysis showed hyperacidity, and examination of the blood revealed a moderate grade of anemia. The basal metabolic rate was — 30 per cent. Obesity, headache, weakness, faulty memory, intolerance to cold, mild visual and aural hallucinations, slow pulse, and dry, scaly skin were ascribed to hypothyroidism. An appendectomy and a cholecystectomy were performed without relief of the abdominal symptoms.

Roentgenologic studies disclosed a spastic condition of the colon, diverticulosis, and right upper quadrant adhesions.

On a dietetic, hygienic, and medicinal regime including antispasmodic drugs, iron, thyroid extract, and plain mineral oil preparations, the gastrointestinal as well as the general symptoms were relieved entirely, and constipation was controlled to the extent that the patient required mineral oil only once a week (Figs. 4 and 5).

COMMENT

The relationship between thyroid function and muscular tonus of the intestinal tract is well established. In thyroid deficiency brilliant results are often obtained by the addition of thyroid extract to the usual treatment.

Case No. 4: E. H., age 44, was a housewife whose illness began six years previously with an acute attack of abdominal pain, nausea, and diarrhea. Since then she had suffered constantly with constipation and took many purgatives, such as milk of magnesia, epsom

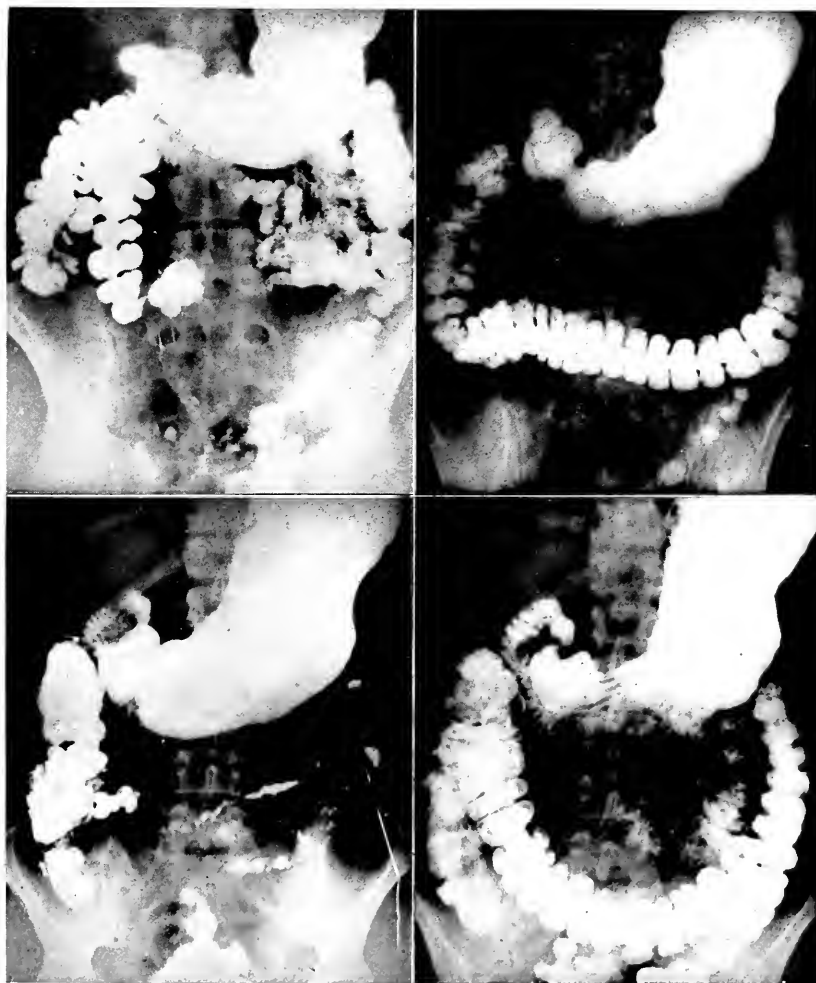


FIG. 4. (Upper left) Spastic colon, diverticulosis and right upper quadrant adhesions.

FIG. 5. (Upper right) Shows the improvement after treatment.

FIG. 6. (Lower left) Spastic constipation with colonic stasis, catarrhal colitis and gastric atony.

FIG. 7. (Lower right) Roentgenogram of the same patient after six weeks' treatment.

salts, castor oil, and cascara. As these remedies became more ineffectual she supplemented them with enemas every other day. The chief symptoms were epigastric pressure, sigmoidal tenderness, mental depression, languor, palpitation, and nocturia. The stools were spastic.

An examination of the blood showed a moderate degree of anemia and the basal metabolic rate was — 18 per cent. The clinical and roentgenologic diagnoses were chronic spastic constipation, colonic stasis, catarrhal colitis, gastric atony, hemorrhoids, and hypothyroidism. Treatment consisted of rest, diet, abdominal compresses, mineral oil, and thyroid extract. As a result, the constipation was controlled and her general health improved (Figs. 6 and 7).

COMMENT

This case is an example of a chronic form of constipation with associated conditions developing after an acute attack of gastroenteritis. Purgatives, except the emollients, are especially contraindicated in this particular form, because they aggravate the colitis and become ineffectual, and ultimately lead to the use of enemas.

Case No. 5: G. S., age 50 years, a housewife, had suffered with constipation for twenty-five years. In recent years she had been subject to periodic attacks of nausea, vomiting, and pain in the right side of the abdomen. During the entire period of her illness she habitually took strong purgatives. As the condition progressed, the purgatives became more ineffectual, the patient lost weight and strength, and developed psychoneurotic manifestations. These included sleeplessness, irritability, lack of emotional inhibition, fears, doubts, obsessions, and periods of profound depression.

On examination the patient was found to be anemic and undernourished. There was an area of diffuse tenderness in the right iliac fossa, where splashing sounds could easily be elicited by palpation or by gently rolling the patient from side to side.

The gastric contents, after the Ewald test meal, showed normal acidity and a considerable amount of mucus. There also was a great deal of mucus in the stool.

The roentgenologic diagnosis was chronic spastic constipation, chronic colitis, and colonic stasis with atonic dilatation of the colon and duodenum.

Since the patient had reached a stage of complete invalidism and failed to respond to the usual method of treatment, a thoroughly organized and systematized bed rest was instituted. This comprised a period of rest in bed; a well balanced, nutritious, non-irritating, laxative diet; warm, moist abdominal compresses; antispasmodic drugs; hypnotics; mineral oil; dilatation of the anal sphincters; physiotherapy and psychotherapy. The response to treatment was prompt and satisfactory. The nervous symptoms subsided, the bowels moved daily, the character of the stools returned to normal, and the patient gained in weight and strength (Figs. 8 and 9). She returned to her former household duties and has enjoyed good health for the past eight years.

Case No. 6: W. G., age 42, a housewife, gave a history of constipation since the age of twenty, and an operative history of thyroidectomy (1927), appendectomy (1930), and oöphorectomy (1931). Following these operations she enjoyed good health until 1938, when she suddenly began to develop periodic attacks of nausea and vomiting associated with severe nervous symptoms. These attacks lasted about one week and recurred every three or four weeks. Some of them were accompanied by carpal spasms typical of tetany.

For twenty years she had taken cathartics almost daily. These were limited at first to phenolphthalein preparations. Later, when these became ineffectual they were supplemented by cascara or citrate of magnesia. Finally, she found it necessary, in order to have an evacuation, to take from two to six of a popular brand of liver pills daily. These caused a watery offensive stool and produced much flatulence, distention, and colicky pains.

In an effort to have a bowel movement she would sometimes precipitate an attack of tetany.

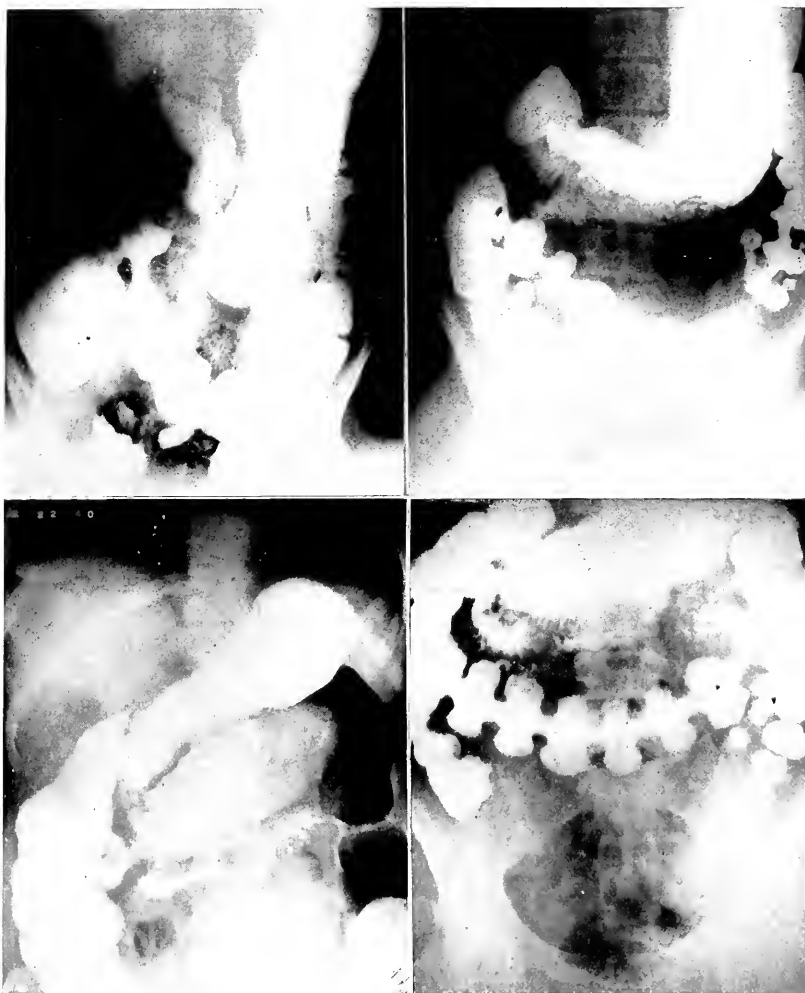


FIG. 8. (Upper left) Segmental dilatation of the duodenum, cecum and ascending colon.

FIG. 9. (Upper right) Shows the improvement as a result of treatment for six months.

FIG. 10. (Lower left) Atonic dilatation of the colon of the type referred to as pseudo-megacolon.

FIG. 11. (Lower right) Roentgenogram taken seven weeks later which illustrates the beneficial results of treatment.

On examination the usual signs of tetany were elicited, and the blood calcium was 6.4 mg. %. Low blood pressure, slow pulse, and subnormal temperature were ascribed to hypothyroidism. The basal metabolic rate was - 21 per cent. The urinalysis, blood

count, kidney function test, gastric analysis, and electrocardiogram were all within normal physiologic limits. The serologic test for syphilis was negative.

Roentgenologic studies on admission showed a fairly normal stomach, megacolon, segmented spastic obstruction with stasis in the ascending and transverse colons, and gaseous ballooning of the descending colon (Fig. 10).

The second roentgenogram taken seven weeks later showed marked improvement of the colon, with corresponding improvement in general health (Fig. 11).

The treatment consisted of strict bed rest with dietary regulation, hot moist abdominal compresses, and the administration of calcium gluconate, belladonna, viosterol, and thyroid extract. Mineral oil was substituted for the more active cathartics. However, as three ounces of this oil daily failed to cause an evacuation in three days, pitressin in $\frac{1}{2}$ to $\frac{3}{4}$ cc. doses was administered parenterally. These doses invariably produced a copious stool within ten or twenty minutes.



FIG. 12. Constipation with cecal stasis and spastic colitis

After the first dose of calcium gluconate, the tetany spasms ceased. Rectal dilation for spastic anal sphincters contributed to the patient's relief.

Following a course of treatment with pitressin the bowels began to function with the use of mineral oil to which cascara at first was added. The blood calcium and basal metabolic rates were maintained at a normal level; symptoms of tetany and hypothyroidism subsided and the bowel movements were controlled with emollient purgatives and without the use of pitressin.

COMMENT

This case is illustrative of chronic constipation attributable to an atonic dilated colon. This type of colonic dilation has often been referred to as pseudomegacolon. The exact etiology is unknown, but theories have been promulgated which attribute the cause to some type of obstruction or to

a late manifestation of a congenital anomaly accentuated by chronic intestinal stasis. It is marked by the presence of obstinate constipation and associated gastrointestinal symptoms. The usual cathartics are used with but little success in this condition.

Proper laxative diet, general hygienic measures, abdominal massage and physiotherapy all contribute to the relief of constipation through nonsurgical measures. It is interesting to note the excellent cathartic effect of pitressin on the atonic dilated bowel. It proved a valuable adjunct in the treatment.

The type of tetany observed in this individual is most likely caused by the gastrointestinal disturbances accompanying a megacolon. Defective calcium absorption or loss from diarrheal attacks induced by violent chronic catharsis may be contributory factors.

Finally, it is possible that hypothyroidism resulting from surgical removal of the gland contributed to the loss of muscular tonus of the bowel. A part of the improvement under treatment is probably affected by the administration of thyroid extract.

Case No. 7: J. M. T., age 51, was a housewife whose chief complaint was indigestion, heartburn, and sour eructations. For the past year the patient had been constipated and took caroid and bile salts daily. She had four successive abdominal operations between the ages of 20 and 42, including an appendectomy, uterine suspension, oöphorectomy, release of adhesions, and a thyroidectomy five years ago.

A diagnosis of chronic spastic constipation and cecal stasis, coloptosis, hypotonic gall bladder with biliary stasis, hypothyroidism, obesity, and secondary anemia was made (Fig. 12).

Improvement followed the usual plan of treatment.

COMMENT

This case is an example of a familiar type frequently encountered following abdominal operations in which too little attention is paid to the medical aspects of the case to insure complete functional recovery. A patient recently under observation and treatment for chronic constipation and colitis with extensive adhesions had undergone twelve abdominal operations.

DISCUSSION

Excessive purgation and a lack of dietetic and hygienic management have given rise to numerous instances in which the patients obviously suffered more from the effects of treatment than from the malady itself. If left alone this condition would have caused little inconvenience and probably would never have progressed into the chronic spastic form with stasis and toxemia. The worst feature of habitual purgation is the tendency to disregard totally the more rational dietetic and hygienic measures so essential in effecting a cure.

In the authors' experience even the severest forms of chronic constipation

with spastic colitis and stasis, if uncomplicated by adhesions or other mechanical obstruction, yielded successfully to a plan of treatment established on a broad and sound physiologic basis as exemplified by the case reports and the improvement noted by roentgenograms. The scope of this paper does not permit a detailed account of the methods employed in the management and treatment of these cases. A complete outline will be found in a previously published article (11).

A few years ago some of these patients who have responded satisfactorily to medical treatment would have been treated surgically by colectomy as advocated by Arbuthnot Lane, an operation with a high mortality rate.

The cases herewith presented, together with the various opinions expressed concerning the therapeutic indications and contraindications for purgative drugs, open a fertile field for sober thought and further clinical investigation.

Unquestionably, in simple constipation (a condition of faulty habits and not an actual disease) self-medication on the part of the laity and negligence through apathy and indifference on the part of the profession often lead ultimately to organic changes with resultant chronic invalidism and disability. Unless this tendency is more generally recognized and more vigorous efforts made to correct it, the evil will continue to prevail and cause much needless human suffering.

REFERENCES

- (1) BOAS, J.: Constipation and Hemorrhoids, pp. 704-734, in *Modern Clinical Medicine: Diseases of the Digestive System*, edited by Frank Billings; translation from *Die deutsche Klinik* under supervision of Julius L. Salinger. Appleton, New York and London, 1906.
- (2) HURST, A. F.: *Constipation and Allied Intestinal Disorders*. ed. 2, Frowde, London, 1919.
- (3) LESLIE, R. MURRAY: Discussion on Alimentary Toxemia. *Proc. Roy. Soc. Med.*, **6**: 272, 1913.
- (4) BAINBRIDGE, W. S.: *Chronic Intestinal Stasis Surgically Considered*. New York *Med. Jour.*, **99**: 153, 1914.
- (5) WHITE, W. HALE: A Discussion on Alimentary Toxaemia; its Sources, Consequences and Treatment. *Proc. Roy. Soc. Med.*, **6**: suppl. 1, 1913.
- (6) LETHBRIDGE, H. O.: Myth of Constipation and Pandemic of Aperientitis. *Med. Jour. Australia*, **2**: 76, 1932.
- (7) GOODMAN, L. AND GILMAN, A.: *The Pharmacological Basis of Therapeutics*. Macmillan Co., New York City, 1941.
- (8) SUBHOFF, KARL: Cited in *An Introduction to the History of Medicine*, Fielding H. Garrison, p. 135. W. B. Saunders Co., Philadelphia, 1914.
- (9) CLARK, A. J.: *Applied Pharmacology*. P. Blakiston's Son & Co., Philadelphia, 1929.
- (10) SOPER, W. H.: Phenolphthalein. *Am. Jour. Digest. Dis.*, **5**: 297, 1938.
- (11) BECK, H. G.: The Management of Chronic Spastic Constipation. *Tr. Am. Therap. Soc.*, **34**: 31, 1934.

CHRONIC STAPHYLOCOCCIC OSTEOMYELITIS*†

REPORT OF A CASE WITH INVOLVEMENT OF THE VERTEBRAE AND FEMUR AND A COMPLICATING EPIDURAL ABSCESS

FRANK DiSTASIO, M.D.

NEW HAVEN, CONN.

This case of chronic staphylococcic osteomyelitis was selected chiefly for consideration of the roentgenologic diagnosis of a benign form of osteomyelitis of the long bones and vertebrae. It was considered of further interest because subsequent to the development of latent neurologic symptoms an epidural abscess was found adjacent to the involved vertebrae. *Staphylococcus aureus* was cultured from the material obtained from one of the bone lesions and from the epidural abscess.

CASE REPORT

H. B., a white female, age 36, was admitted to the University Hospital on May 4, 1939 in the service of Dr. M. C. Pincoffs. The patient complained of a painful, swollen left knee, and of pain in the back and in the left hip. She had always enjoyed good health until the present illness, which began early in September, 1938. There was no history of trauma to the knee or back, but the patient recalled that there had been a furuncle on the left side of the neck about one month before the onset of the symptoms noted. A scar from this furuncle remained in the left anterior triangle of her neck. The left knee had been decidedly swollen and painful and these symptoms were present at the time of admission. In October, 1938 soreness developed over the entire abdomen. At that time the patient was admitted to a hospital in Cumberland, Maryland, where she remained for several weeks with no improvement. Until her admission to the University Hospital on May 4, 1939 she had suffered with vague pains in her shoulders and elbows. At one time the right knee also was slightly swollen and tender. For a month before admission the patient complained of frequency of urination and of nocturia. In addition, there had been numbness about the perineum and constipation.

The general physical examination revealed evidence of weight loss, with decided pallor of the mucous membranes and a quickened pulse rate of 124 to the minute. All of the upper teeth and several lower ones had been removed. The blood pressure was 120 mm. of mercury systolic and 80 mm. diastolic. The left knee was swollen and tender, and there was pain with limitation of motion in the lumbar spine. Tenderness was found just lateral to the spinous processes in the lumbar region, especially at the second lumbar vertebra.

The positive findings of a neurologic examination made by Dr. J. G. Arnold, Jr. on May 10 were: Weakness of dorsiflexion in both feet but more distinct in the left; weakness of all movements in the lower extremities, with an accompanying decrease in the muscle tone; atrophy of the quadriceps, perineal, and posterior muscles of the left leg; atrophy of

* From the Department of Roentgenology, School of Medicine, University of Maryland, Baltimore, Md.

† Received for publication February 25, 1942.

the gastrocnemius muscle on the right; saddle anesthesia to the prick of a pin over the fourth and fifth sacral segments on the left. The reflexes of the right knee were active; the left knee could not be tested because of the presence of swelling. The ankle reflexes were present, but slightly sluggish; the rectal and vesical reflexes were poor.

It was thought that the tenderness over the lumbar spine might be caused by arthritis or a low grade osteitis. It was further suggested that because of the persistent neurologic symptoms a laminectomy might at any time become necessary.

A spinal puncture at the third lumbar vertebra on May 10 yielded xanthochromic fluid. The Queckenstedt sign showed a complete block. The reaction in Pandy's test was 4 plus and there were no cells.

Repeated blood counts showed a mild secondary anemia. A complement fixation test of fluid obtained from the left knee joint was negative for gonorrhea. The tuberculin test was likewise negative. Bence-Jones protein was not found in the urine on repeated examinations.

In the hospital the patient showed a low septic temperature curve with rises from nearly normal in the morning to 100 or 101 F. in the evening. The pulse rate varied from 100 to 140 a minute.

The first roentgen ray examination on May 8, 1939 revealed a small area of rarefaction in the frontal region of the skull; examination of the chest was negative on that date. The left thigh, including the knee, showed an area of rarefaction localized in the lower third of the femur, with some periosteal new bone formation around the lower third of the shaft. These changes were considered consistent with an infectious process. There was no evidence of erosion of the articular surfaces of the bone. Osteomyelitis of the lower half of the shaft of the left femur was suggested as a diagnosis. A roentgen ray examination of the spine at the same time was considered unsatisfactory for diagnosis and further study advised when the patient's condition permitted.

On May 16, 1939 under local anesthesia a biopsy was performed on the lower end of the left femur. The bone lesion involving the left femur was curetted and a culture of this material revealed *Staphylococcus aureus hemolyticus*. The pathologic report of Dr. M. S. Sacks concluded that the microscopic findings were "compatible with a diagnosis of the skeletal form of essential xanthomatosis, Schüller-Christian variety, with superimposed acute and chronic inflammatory changes."

Because a neoplastic disease of the lower dorsal and lumbar regions of the spine was suspected roentgen therapy was administered. From May 23 to June 2 a 20 cm. portal was chosen to cover from the twelfth dorsal vertebra to the upper sacral regions of the spine, and 200 r units were delivered daily until 2000 r units had been administered. The factors were 200 kv., 20 ma., a target skin distance of 50 cm., and a filter of 1.0 mm. of copper and 1.0 mm. of aluminum. From June 12 to June 29 the lower dorsal and upper lumbar regions were irradiated again with the same factors; 1435 r units were delivered directing the rays from the right, with 1218 r units from the left. The patient noticed an improvement of bowel and bladder control, but still complained of saddle anesthesia. The light touch was impaired at the level of the fourth and fifth sacral segments.

A more extensive roentgen ray examination of the dorsal and lumbar regions was made on June 10. It showed destructive lesions in the region of the disk between the twelfth dorsal and the first lumbar vertebrae; also between the first and second, second and third, and third and fourth lumbar vertebrae. The destructive process appeared to have involved the intervertebral disks and the bodies of these vertebrae. A small area of rarefaction was noted in the head of the left femur and was considered a part of the same process. The dorsal spine showed a narrowing of the joint spaces between the bodies of the sixth and seventh and between the eighth and ninth vertebrae.

In July the patient remained unimproved and the fever was still of the low grade type.

A moderate leukocytosis developed. In view of the persistence of the neurologic findings a laminectomy in the region of the twelfth thoracic and first and second lumbar vertebrae was performed on July 19. An epidural abscess was found and drained; the position of this abscess was anterolateral to the dura. *Staphylococcus aureus* was cultured from the pus obtained at operation. Although the elevation of temperature was not greatly reduced, there was some improvement in the patient's control of the bowel and bladder.

Supportive treatment consisted of two blood transfusions, injections of autogenous vaccine, massage and passive motion of the extremities. Improvement was slow at first and the fever continued for many weeks.

A third roentgen ray examination of the lower dorsal and lumbar regions of the spine was made on September 30, two months and eleven days after the laminectomy. This showed little change in the amount of destruction of bone previously noted on June 10. A small amount of new bone formation was seen along the anterior borders of the bodies of the lumbar vertebrae; this indicated a healing process. A further examination of the spine on December 15, 1939 showed a healing osteomyelitis of the dorsal and lumbar vertebrae.

Improvement was gradual thereafter. There was acute arthritis of the right knee in April, 1940. By July, 1940 the patient was afebrile; there were no areas of hyperesthesia or anesthesia. Control of the bowel and bladder was normal. The patient could move both legs, but had not attempted to walk. Her general condition was satisfactory.

Smith (1) has published an excellent article on the benign form of osteomyelitis of the spine. He reported finding this type much more frequently than the acute fulminating variety which is more often featured in the literature. *Staphylococcus aureus* was the organism obtained from the lesions in six of seventeen cases; two of his patients had spastic paralysis. The true nature of the disease was not recognized on several occasions because the chronic form of osteomyelitis produced mild symptoms which did not attract sufficient attention to the vertebrae.

In order of frequency the regions involved are lumbar, cervical, dorsal, and sacral. One or more vertebrae may be affected. Some authors state that the posterior arches are more often involved than the bodies, except in the cervical region. The value of the roentgenogram in the diagnosis can scarcely be overestimated. However, early in the disease, a roentgenographic study may be negative or may show only slight haziness or indistinct changes of the bony structures.

In a recent article McNutt (2) described thoroughly the roentgenologic findings in osteomyelitis of the vertebrae. He stated that this disease develops as a subperiosteal type or in young individuals as an epiphyseal separation. According to McNutt, "The tendency to new bone formation is characteristic of this condition and the lesion may first be noted on the roentgenogram as a rarefying and proliferative osteitis. More commonly it develops as a destructive bone lesion which shows early new bone formation. The outline of a paravertebral abscess may be present early. It is not, however, a constant finding. The intervertebral disk may or may not be involved, although a uniform narrowing is frequently seen. The tend-

ency to form new bone may prevent deformities such as kyphosis or scoliosis." He noted that in chronic benign cases, when pain was not a feature, considerable deformity often had occurred before the patient presented himself for treatment.

The differential diagnosis of benign osteomyelitis of the spine may be difficult. On first seeing the roentgenograms of the case being reported the roentgenologist might have been baffled as to the probable etiology. The findings in the lower end of the left femur, which were rather typical of osteomyelitis, together with the clinical history and the subsequent finding of an epidural abscess, made a diagnosis of osteomyelitis of the spine and femur most probable. There are a number of other conditions which must be differentiated from osteomyelitis of the spine. In tuberculosis there is an irregular destruction of one or more vertebral bodies, with resultant kyphosis. Such deformities rarely occur in osteomyelitis. Typhoid osteitis is a late complication of typhoid fever and should be recognized without difficulty by the history. Metastatic carcinoma can be diagnosed with certainty when the primary site is described. Luetic involvement of the spine may be confused with pyogenic osteitis since there are proliferative and destructive changes in both conditions. However, in lues the disks are usually preserved and a positive serologic reaction of the blood or other evidence of syphilis is of further help. Actinomycosis of the spine produces characteristic clearly defined areas of rarefaction. Hodgkin's disease may cause difficulty until biopsy or the radiosensitiveness of the lesion make the diagnosis clear. Multiple myeloma should be differentiated by the lesions in the cranial bones and ribs, and by the finding of Bence-Jones protein in the urine. Schüller-Christian's disease is likewise easily distinguished by its clinical characteristics.

A spinal epidural abscess is most often an acute, rapidly progressing condition. As in the case here reported, the *Staphylococcus* is nearly always the causative organism. Epidural abscesses result from a metastatic infection or from direct extension of a localized lesion in close proximity to the spine. The clinical picture is characterized by signs and symptoms of infection and severe pain in the back, with tenderness over the spinous processes. This pain is of a boring nature. In the typical acute case these symptoms are followed in a few days by nerve root pains and by signs of compression of the cord which are promptly followed by complete paraplegia. Three such cases were reported recently in an article by Pincoffs and Gundry (3). They reviewed the literature and found that untreated cases were uniformly fatal, whereas of those who had had a laminectomy about 60 per cent recovered.

Dandy (4) in 1926 found reports of eight instances of inflammatory tumor in the epidural space and added two cases of his own. In all of these the

onset of paralysis occurred late in the course of the illness and the paralysis was often not complete. These cases correspond more closely with the one here reported than the much more frequent acute epidural abscesses of which Dandy tabulated twenty-four. He noted that the pain in cases of inflammatory tumor was more gradual in onset and less fulminating than in the other group.

The clinical picture of metastatic osteomyelitis of the spine complicated by an extradural abscess is not particularly unusual. However, the fact that complete paraplegia has not occurred after several months is a very interesting and rather puzzling circumstance. The explanation no doubt is to be found in the location of the abscess, anterolateral to the cord. Such collections of pus are almost without exception found dorsal to the spinal cord. The amount of improvement after an operation late in the disease is also truly remarkable.

CONCLUSIONS

1. Osteomyelitis of the vertebral bodies occurs frequently in a comparatively mild form and may easily be mistaken for tuberculosis, syphilis, carcinoma, typhoid, actinomycosis, multiple myeloma, or Schüller-Christian's disease.

2. An accurate and complete history is important since it may reveal a definite focus of infection, such as a furuncle or carbuncle, which has healed entirely before the metastatic lesions make their appearance.

3. Osteomyelitis of the vertebral column, like an epidural abscess, is most commonly hematogenous in origin; both usually are caused by the *Staphylococcus*. However, when both osteomyelitis and an epidural abscess are seen in the same patient the epidural abscess arises by direct extension from the osteomyelitis.

4. The lesions of the vertebrae have a marked tendency to produce spontaneous bony fusion of the vertebral bodies with little, if any, residual gross deformity.

BIBLIOGRAPHY

- (1) SMITH, ALAN DEFOREST: A Benign Form of Osteomyelitis of the Spine. *Jour. Am. Med. Assn.*, **101**: 335, 1933.
- (2) McNUTT, JOHN R.: Roentgen Diagnosis of Osteomyelitis of the Vertebrae. *Am. Jour. Roentgenol.*, **39**: 52, 1938.
- (3) PINCOFFS, M. C. AND GUNDY, LEWIS P.: Epidural Spinal Abscess with Paraplegia. *Internat. Clin.*, **3**: 49, 1936.
- (4) DANDY, WALTER E.: Abscesses and Inflammatory Tumors in the Spinal Epidural Space. *Arch. Surg.*, **13**: 477, 1926.

PERFORATION OF THE BLADDER BY A NONOSSEOUS RETROPERITONEAL ABSCESS*†

REPORT OF A CASE

MOSES GELLMAN, M.D.

BALTIMORE, MD.

The hip is a rather sensitive joint which reacts promptly to local or nearby irritative processes by assuming unnatural attitudes and restrictions of motion. The commonest acute suppurative process involving the region of the hip is most likely to be osteomyelitis of the central acetabular area of the innominate bone or the head and neck of the femur. When such foci affect these parts, the greatest comfort for the patient is attained by relaxing the tissues and ligaments about the hip joint. The thigh of the affected extremity assumes a position of flexion and abduction, the limb is rotated in an outward direction, and there is some bending of the knee. Upon encountering such deformities the chief difficulty in differential diagnosis lies in the practical impossibility of distinguishing early whether the lesion is situated within the capsule, whether it is present in some part of the three pelvic segments, or, indeed, if it has any connection whatsoever with these parts. Though a definite diagnosis is for the time being held in abeyance, local and systemic treatment is begun pending further observations, tests and developments. Sooner or later, in most cases, further changes lead to a more accurate evaluation of the true state of affairs and permit the institution of more appropriate measures to combat the disease that subsequently is actually demonstrated.

The following case is an example of early diagnostic confusion in a patient who had symptoms of a generalized infection and signs that pointed to an affection of the hip. The history is given in detail in order to chart the course of the disease. A surprising climax finally was reached, which should make this presentation of some interest.

REPORT OF CASE

J. W., a 3 year old negro girl, was first seen in the pediatric clinic of the University Hospital dispensary. The history given at that time and the one reported at the Kernan Hospital for Crippled Children differed to some extent as to prodromes and dates, but in the main was as follows.

On or about March 10, 1940 the child had an unusually severe cold accompanied by fever, abdominal discomfort, and vomiting. Two weeks later she began to complain of

* From the Department of Orthopedic Surgery, School of Medicine, University of Maryland, and the Kernan Hospital for Crippled Children.

† Received for publication August 19, 1942.

pain in the left hip and the leg began to "bend up and would not straighten out." On March 27, 1940 she was brought to the dispensary, where it was found that the temperature was 101 degrees rectally and that the throat was injected, but there seemed to be no joint involvement. The impressions were: (1) possible rheumatic disease, (2) pharyngitis, and (3) undernutrition. On April 3 a return visit was made with the additional



FIG. 1



FIG. 2

FIGS. 1 AND 2. Appearance of the patient on admission, April 4, 1940

complaint of burning on urination. The temperature was 102.4 degrees rectally and the throat still was injected. An abdominal examination was negative, but the left leg was described as adducted and the knee was flexed. A urinalysis revealed 2 to 4 epithelial cells, 2 to 6 pus cells, and 0 to 1 red blood cell in each high power field. Roentgenograms showed a moderate increase in the root shadows and thickening of the larger bronchi; there was no evidence of bone or joint destruction in the pelvis and hips. The clinical impression given was a questionable tuberculous involvement of the left hip.

On April 4 all clinical findings were essentially the same. Pus cells again were found in the urine. The intradermal tuberculin test, 1:10,000, was negative after twenty-four hours. The patient was then referred to the Department of Orthopedic Surgery, where the following notation was recorded by the examining surgeon: "Typical tuberculosis of the left hip with flexion, abduction and external rotation. Some atrophy, muscle spasm and pain. History of night cries and sweats."

The patient was admitted to the hospital later in the day. The important additional data noted were an elevation of temperature to 102 degrees rectally, profuse purulent nasal discharge, a reddened throat, and some rigidity in the left lower quadrant and in the midline over the bladder. There was slight fullness over the rigid area and a feeling of the presence of a mass above and below the left inguinal ligament, with possible fluctuation in the latter region. The entire left thigh appeared larger than the right. On standing (Figs. 1 and 2), the weight was borne on the right leg, maintaining the left leg and thigh in a position of abduction and flexion with a slight amount of external rotation and bending of the knee. There was no swelling or tenderness over or around the left hip, but restriction was noted on internal rotation and in extension. No shortening was present and the spinal movements were free.

Roentgenograms of the spine, pelvis and hips revealed no evidence of bone involvement twenty-five days after the onset of the malady.

Laboratory findings. Examination of the blood showed 35,450 white blood cells, with polymorphonuclears 89%. The urine contained 3 to 4 pus cells per high power field. The serologic test for syphilis was negative. A subcutaneous injection of 1 cc. old tuberculin 1:1000 gave a positive reaction.

Impression. (1) Possible epiphysitis of the left hip; (2) possible tuberculosis of the left hip.

The immediate treatment consisted of general supportive measures. Application of traction to the left leg was followed by a rather rapid and painless correction of the hip deformities. The temperature, however, remained elevated and at times was as high as 104 degrees rectally. Sulfanilamide and later sulfathiazole in moderate doses were given, with a blood level of 5.0 mg.%. There was no record of a blood culture having been made at any time. Daily examination of the urine showed an increase in the number of pus cells, with clumping. Staphylococcus albus and gram-positive rods were recovered on culture. Pyelitis was considered a likely diagnosis.

Aspiration of the left hip on April 12 was negative. During this procedure a small amount of normal saline solution was injected into the joint and reaspirated. A culture of this material was sterile.

The fullness in the left lower quadrant above and below the inguinal ligament gradually became more apparent and began to take on the appearance of a circumscribed firm, painless, oval mass. It was situated between the iliac fossa and the bladder and extended into the left groin, where it seemed to be pointing. A rectal examination was never made. Complete motion had returned in the hip and all the deformities disappeared. The diagnosis of a psoas abscess was then made.

On April 15, while ward rounds were being made, a number of physicians interested in the case examined the mass, percussing it to outline its extent and palpating it rather firmly. Suddenly the child winced, began to whine, and insisted she had to void at once. Thereupon she passed into a glass urinal 75 cc. of what appeared to be frank pus. The bladder had been perforated.

An immediate aspiration of the pointing inguinal mass produced pus of the same character as that passed from the bladder. The child was taken to the operating room and through a small linear incision just below the inguinal ligament and lateral to the femoral artery 250 cc. of purulent material was evacuated from beneath the rectus femoris muscle.



FIG. 3. (top). Cystogram (April 18, 1940) demonstrating the bladder pushed toward the right side of the pelvis. The extravasation of opaque material may be seen outside of the bladder and into the left side of the pelvis.

FIG. 4. (center). Cystogram (May 1, 1940) showing the same condition as in Fig. 3, with a minimal amount of extravascular extravasation.

FIG. 5. (bottom). Cystogram (May 21, 1940) illustrating the return of the normal contour of the bladder.

Upon insertion of the finger into this incision the digit passed upward under the descending ramus of the pubis into a large space, the extent of which could not be estimated. Medially this space extended toward the symphysis. After the drainage subsided to some degree, a catheter was placed into the bladder and a similar type of material was obtained. An instillation of 10% argyrol was made into the bladder, but none of it was recovered from the inguinal incision. The wound was drained adequately. *Staphylococcus aureus* was produced from cultures of the purulent material from both sources.

A gastrointestinal examination on April 17 revealed no appendicular or diverticular involvement. On the third postoperative day the temperature became lower and did not rise above 100.5 degrees rectally thereafter. Several blood transfusions were given to support the general condition of the patient.

On April 18 a cystogram (Fig. 3) showed the bladder to be crowded over toward the right side of the pelvis by extravesimal pressure on its left lateral wall. Some of the sodium iodide had extravasated outside of the bladder into the left pelvis.

There was no bone pathology demonstrable in the lower spine, pelvis, hips or upper femurs on April 19.

Intravenous pyelograms made on April 22 were negative for renal, perirenal or ureteral disease.

On May 1 a complete cystoscopic examination by Dr. B. S. Abeshouse revealed most interesting findings. After the bladder was distended with water both ureteral orifices were seen, the left appearing red and indurated about its periphery. An examination of the left upper and lateral wall of the bladder showed a healing area which no doubt represented the point of rupture of the abscess. This area measured $1\frac{1}{2}$ cm. in diameter. Upon insertion of a larger cystoscope it could be defined with greater ease. An attempt to pass a catheter through it proved unsuccessful. Pyelograms were negative, but a cystogram (Fig. 4) showed the bladder to be slightly elongated and pushed over to the right side, with its left lateral wall still flattened.

On May 21 a cystogram (Fig. 5) showed that the contour and position of the bladder were normal.

The patient made an uneventful recovery and left the hospital in an improved condition on May 29, fifty-five days after admission. She was seen finally in the dispensary on July 29, 1940. All findings were negative and she was discharged as cured.

DISCUSSION

This case, which in retrospect seemed to have been handled none too well, had numerous interesting and puzzling features during its developmental stages. The major and obvious finding appeared to be an involvement of the hip. Urinary complaints were almost as prominent early in the disease process as were those of the joint, but for some reason they were relegated to secondary importance. It did not take especially long, though perhaps long enough, to discover that an extra-articular focus was irritating the hip by juxtaposition, just as the same focus at the same time was irritating the bladder. Purulent collections originating elsewhere often set up a secondary response in the hip as they approach the para-articular tissues. Examples of this phenomenon include retroperitoneal spinal or glandular abscesses which rupture into the psoas space. Diverticular or appendiceal abscesses, perinephritic or subdiaphragmatic accumulations, even em-

pyemas, may in some manner eventually point at a considerable distance from their original source. By gravitational, retrograde or active lateral dissection by one or more devious and bizarre pathways these abscesses exert influence upon contiguous sensitive organs. As they seek an exit they may rupture into the bladder and rectum.

The process in this instance probably began at least five weeks before the eventual climax, when the child first complained of abdominal pain. The bladder most certainly was implicated at least two weeks before it was perforated. After this occurred much effort was made to determine the source of the abscess, but no definite focus could be found. It is likely that the deep retroperitoneal glands became infected secondary to a severe nasopharyngeal condition. These glands suppurated slowly and finally by direct extension the abscess penetrated the enveloping pelvic fascia as well as that of the adjacent bladder. The perforation of the bladder was impending for a long time. This probably would have taken place spontaneously not much later than April 15, but was hastened in an unorthodox but fortuitous manner by manual manipulation on the part of several examiners. The final outcome left no residual evidence of harm.

SUMMARY

A case of perforation of the bladder by a nonosseous retroperitoneal abscess is presented. The abscess probably arose from nearby suppurating glands. In seeking an outlet the abscess burrowed past the hip, downward and sideways into the bladder. Drainage was also aided by an incision in the inguinal region. The recovery was satisfactory and complete.

END RESULTS OBTAINED IN BALTIMORE JUNIOR LEAGUE CURATIVE WORKSHOPS*†

NANCY VALLIANT, O.T.R.

BALTIMORE, MD.

The Junior League of Baltimore sponsored two curative workshops, one at the University Hospital and one at the Johns Hopkins Hospital. These workshops were established to administer occupational therapy to orthopedic and surgical cases only.

The need for muscle reeducation combined with psychologic stimulus is a factor in the treatment of fractures, lacerations, burns, and similar disabling injuries. Occupational therapy offers psychologic stimulus in conjunction with physical exercise, thereby restoring the patient to normal or to the maximum working ability.

There are no machines to do the work. The disability is treated by the patient's own active exercise, which is performed under supervision and limited to the extent of his capability. For example, when the knee requires greater flexion and extension, the patient is instructed in the use of a bicycle saw; if the ankle needs increased dorsi and plantar flexion, the patient is assigned to a foot treadle saw. A range of graded active exercise is furnished in the use of simple woodworking tools and plain rug weaving. The recovery of muscle, joint, and nerve functions by occupations which give interesting exercise is not guesswork, but can be verified with occupational therapy records which show any increased motion in degrees.

The standard system of measurement of joint function used at the fracture clinic at the Massachusetts General Hospital has been adopted. The general principle for measuring all motions is by degrees from a neutral point of zero and by determining all angles with a protractor. The method of charting herein illustrated was devised in the Baltimore curative workshops.

During the past year three-fourths of all the patients referred to the curative workshops were fracture cases. A study based on patients who have received five or more treatments has been made on 150 fracture cases. The classifications used in determining the results of this study were: *improved*, *slightly improved*, and *unimproved*. If the number of degrees of increased motion is more than fifteen, the result is classified as improved. When the gain is at least five degrees of motion and no more than fifteen degrees, the result is classed as slightly improved. If there is no gain in

* Presented at the Annual Meeting of the American Orthopedic Association, Hurd Hall, Johns Hopkins Hospital, June 3, 1942.

† Director of Occupational Therapy, University Hospital.

the degrees of motion the result is naturally regarded as unimproved. Thus has a definite line of demarcation of end results been set up between the groups. Fractures lend themselves well to a follow up system, because their end results can be rated not only functionally but anatomically and economically as well.

Of the 150 fracture cases receiving five or more treatments, 94 per cent improved, 4 per cent were slightly improved, and 2 per cent were unimproved. The average number of treatments was 16.5 in the improved group, whereas the average number in the slightly improved and unimproved groups was only half as many.

An economic evaluation in point of time and money led to a division of the group of 150 according to the time occupational therapy was prescribed in relation to the time the cast was removed. The findings were that 64 per cent were treated either the day the cast was removed or within two weeks; 95 per cent improved, with an average of 16.2 treatments per person. The time element is of great importance. Those treated from two to four weeks after the cast was removed made up 18.7 per cent. The remaining 17.3 per cent were treated one month or more after the cast was removed. The rate of improvement with these last two groups dropped 10 per cent when occupational therapy was started at a later date in comparison to those beginning the day the cast was removed or within two weeks.

The study further groups the fractures according to types and location, but it was found with each that a prolonged waiting period was a functional and economic disadvantage. The investigation showed that the majority of the fractures referred for treatment were in the upper extremity. It is quite common for patients to be sent to the workshop for finger exercises while still wearing a cast on the forearm or a bivalved cast. Every week is 2 per cent of the year, and time counts in restoring the patient to an economic basis and in giving the maximum improvement.

The University Hospital referred seventy-three of the series of 150 cases. It was noted that only thirteen of the seventy-three were given physiotherapy as well as occupational therapy and all improved. Of the remaining sixty who received only occupational therapy and no physiotherapy, fifty-six improved, two were slightly improved, and two were unimproved.

Because of necessity the curative workshops were only open on alternate days at each hospital until this year. It is economically of interest to note that since the workshop at the University Hospital is open for daily treatment patients are discharged noticeably sooner than when they could only be treated every other day.

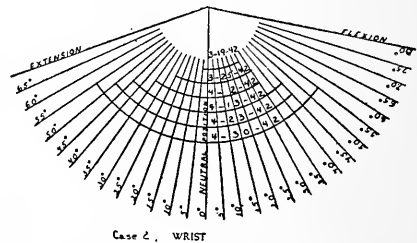
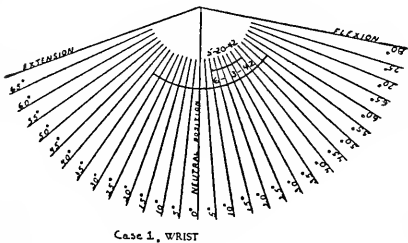
The purpose of introducing occupational therapy into the two largest

dispensaries in Baltimore seven years ago was to assist the hospitals in discharging orthopedic and surgical patients in the shortest possible time and in the best physical condition.

CASE REPORTS

The following cases were presented at the annual meeting of the American Orthopedic Association held on June 3, 1942.

Case No. 1: L. R., a white female, age 37, was referred to the curative workshop the day her cast was removed. The diagnosis was a comminuted fracture of the distal end of the left radius and fracture of the left ulnar styloid. She had worn a cast for three and a half weeks. On the first day the patient, seated with her arm resting on a table, did paper crumpling for finger flexion and extension. The next treatment, several days later, consisted of sanding on a curved surface with a two-handled sander held alternately in a pronated and a supinated position for wrist flexion and extension. She was unable to come for treatment on the days the workshop was open, consequently in two weeks she received only four treatments. On admission her wrist lacked ten degrees of reaching the neutral position from which dorsiflexion is measured, and palmar flexion measured

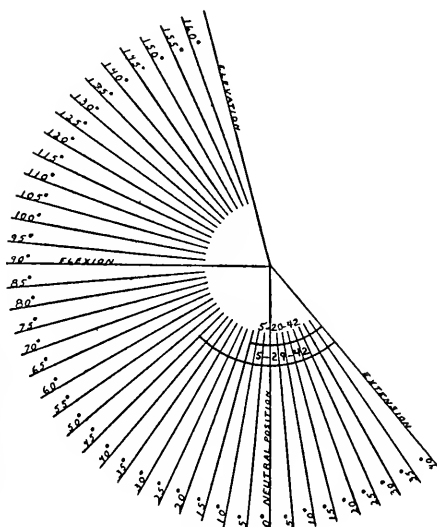
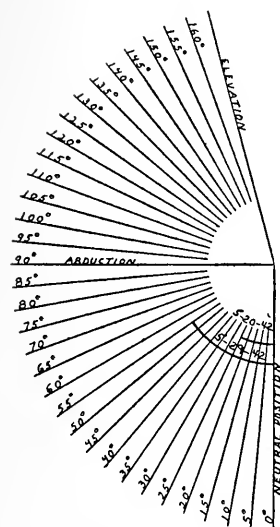


forty degrees. When seen last her wrist measured thirty-five degrees of dorsiflexion and fifty-five degrees of palmar flexion.

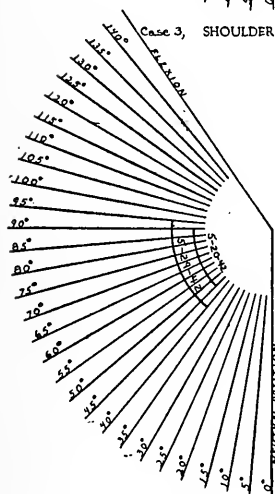
Case No. 2: E. P., a 46 year old white female, had a Colles' fracture of the right wrist. She had worn a cast for five weeks, and on the day it was removed was referred to the curative workshop. This patient also started treatment with paper crumpling and curved sanding as described in Case No. 1. The treatment being progressive she advanced to sawing wood with a coping saw for wrist flexion and extension, screw driving for pronation and supination of the forearm, and to filing on a diagonal plane for wrist extension. She came to the workshop daily for six weeks and received a total of twenty-nine treatments.

On admission her wrist measurements were five degrees of dorsiflexion and thirty degrees of palmar flexion. When discharged she had fifty-five degrees of dorsiflexion and fifty-five degrees of palmar flexion.

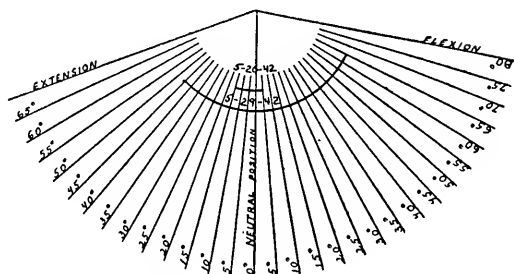
Case No. 3: M. B., a white female, age 47, received a compound comminuted supracondylar fracture of the humerus. She was in traction for two and a half weeks and then in a plaster cast for three and a half weeks. As a result, not only the elbow but the shoulder and wrist were also severely limited. The day the cast was removed she was sent to the curative workshop. At first the patient, seated with a weaving frame placed low, did braid weaving for shoulder flexion, abduction, and external rotation. Also seated, she sanded in a sagittal plane for elbow flexion and extension. She used a short-handled drill alternately in a pronated and a supinated position for wrist flexion. The



Case 3, SHOULDER



Case 3, ELBOW



Case 3, WRIST

patient attended the workshop on the days it was open and received six treatments in two weeks.

	Flexion	Extension	Abduction
Shoulder measurements:			
May 29, 1942.....	45°	40°	55°
May 20, 1942.....	15°	40°	25°
Gain.....	30°	0°	30°

	<i>Flexion</i>	<i>Extension</i>
Elbow measurements:		
May 29, 1942.....	95°	40°
May 20, 1942.....	90°	45°
	—	—
Gain.....	5°	5°

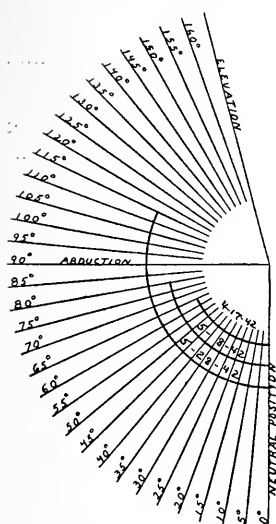
	<i>Palmar Flexion</i>	<i>Dorsiflexion</i>
Wrist measurements:		
May 29, 1942.....	65°	45°
May 20, 1942.....	5°	15°
	—	—
Gain.....	60°	30°

Case No. 4: E. J., a colored female, age 58, sustained a fracture of the surgical neck of the humerus and was in a cast for three and a half months. Treatment in the workshop was prescribed at once, but she was unable to begin until a week later. The patient started with braid weaving in the manner described in Case No. 3. In time she advanced to the floor loom, where seated she did rug weaving for grasp, pronation and supination of the forearm, elbow flexion and extension, and shoulder flexion and abduction. She used a long-handled drill in supinated position for elbow flexion and extension. Finally, standing alternately in position for shoulder flexion and then abduction, she sawed wood at shoulder level with a rip saw, and gradually raised the level of sawing and increased the amount of wood sawed. She received thirty-three daily treatments in six and a half weeks in the workshop.

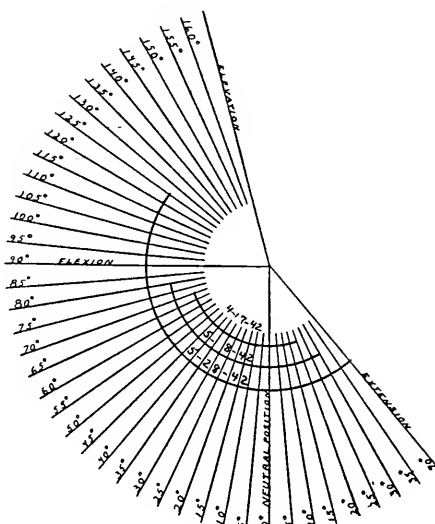
	<i>Flexion</i>	<i>Extension</i>	<i>Abduction</i>
Shoulder measurements:			
May 28, 1942.....	125°	40°	115°
April 17, 1942.....	70°	20°	65°
	—	—	—
Gain.....	55°	20°	50°

	<i>Flexion</i>	<i>Extension</i>
Elbow measurements:		
May 28, 1942.....	120°	5°
April 17, 1942.....	70°	10°
	—	—
Gain.....	50°	5°

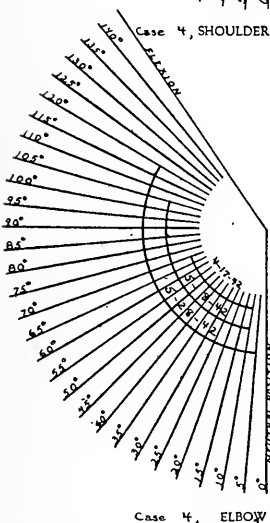
	<i>Palmar Flexion</i>	<i>Dorsiflexion</i>
Wrist measurements:		
May 28, 1942.....	30°	40°
April 17, 1942.....	15°	20°
	—	—
Gain.....	15°	20°



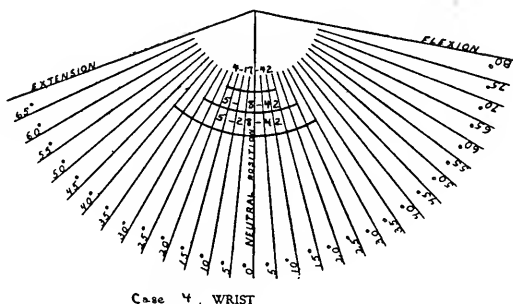
Case 4, SHOULDER



Case 4, SHOULDER



Case 4, ELBOW



Case 4, WRIST

COMMENT

The first patient, L. R., was a meat wrapper in a packing house. In view of her occupation early treatment proved an economic as well as a functional advantage. It is doubtful whether she would have reached ninety degrees of motion in her wrist within two weeks after the cast was removed if treatment had not been started at once.

E. P., of the second case, did housekeeping as a permanent job. In

spite of the fact that she was an older woman, her wrist improved seventy-five degrees in motion within a reasonable time and enabled her to resume her former responsibilities.

In the third case, M. B. was a seamstress who depended on a functioning right arm. Her serious apprehension of a permanent disability practically inhibited any natural attempt to exercise. Had she been allowed to remain at home her arm would have become useless. The improvement in the first two weeks was attributed in part to overcoming her genuine alarm as well as accomplishing specific exercise of the wrist, elbow, and shoulder at an early date.

The last patient, E. J., was a domestic worker. She had suffered from arthritis for years and, considering her age, probably achieved her maximum working ability. Without supervised treatment it is hardly likely that she could have returned to service in such a brief period.

SUMMARY

Active motion performed by the patient himself is of great value in lessening the period of disability and in securing early functional return. This theory, advocated to prevent stiffening of the joints following immobilization, is the basis of treatment in a curative workshop. The treatment value of manual skill depends on the position of the work and the placement of the patient in relation to the handicraft. The dose increases in proportion to the improvement shown by the patient.

BIBLIOGRAPHY

- (1) CAVE, E. F. AND ROBERTS, S. M.: A Method for Measuring and Recording Joint Function. *Jour. Bone and Joint Surg.*, **18**: 455, 1936.

WILLIAM HUNTER AND HIS MAGNUM OPUS*†

J. E. SAVAGE, M.D.

BALTIMORE, MD.

"William Hunter was born on the 23rd day of May, 1718, at Kilbride, in the county of Lanerk. He was the seventh of ten children of John and Agnes Hunter, who resided on a small estate in that parish, called Long Calderwood, which had long been in the possession of his family.

"At the age of fourteen, his father sent him to the College of Glasgow. In this seminary he passed five years and by his prudent behavior and diligence, acquired the esteem of the professors, and the reputation of being a good scholar.

"His father had designed him for the church, but the idea of subscribing to articles of faith, was so repugnant to the liberal mode of thinking he had already adopted, that he felt an insuperable aversion to his theological pursuits. In this state of mind, he happened to become acquainted with Dr. Cullen, the present celebrated professor at Edinburgh, who was then just established in practice at Hamilton, under the patronage of the Duke of Hamilton. Dr. Cullen's conversation soon determined him to lay aside all thoughts of the church, and to devote himself to the profession of physic." Thus begins "An Account of the Life and Writings of the Late William Hunter" by one of his associates in the Society of Physicians of London, Samuel F. Simmons (17). This account was delivered as an address on August 6, 1783, just a few days more than four months after Hunter's death.

In 1737, at the age of nineteen, after having obtained the consent of his father William Hunter went to live with Dr. Cullen. From then to 1740 he lived in the intimacy of the Cullen family at Hamilton. In November, 1740 Hunter began his formal medical studies at Edinburgh, where he came under the influence of Alexander Monro. In the summer of 1741 he moved to London and there he lived with William Smellie, who was then an apothecary. A friend of Hunter's in Glasgow, a printer, had given him a letter of introduction to Dr. James Douglas. This circumstance affected the entire course of Hunter's life. James Douglas, also a Scotsman, was then preparing an anatomic work dealing with the bones and was seeking a young man to make the dissections. William Hunter was so engaged and taken into the Douglas family. Since both Dr. Cullen and William Hunter's father expected William to return as a partner of Dr. Cullen in Hamilton, it was necessary for him to obtain their permission to accept this new posi-

* Read before a meeting of the Cordell Historical Society, April 29, 1942.

† From the Department of Obstetrics, School of Medicine, University of Maryland.

tion. Douglas was a man of many attainments, being one of the leading obstetricians in London, an anatomist, and a classical scholar. Concerning the influence on Hunter of his association with James Douglas, Peachey (14) wrote, "Short as his association with Douglas was destined to be, for James Douglas died in April, 1742, the effect it produced upon William Hunter's character was threefold: a love of books, a zeal for anatomy, and a choice of obstetrics as a means of future livelihood. . . . the influence of James Douglas was probably the most far reaching. As a bibliophile he had brought together a superb collection of the various editions of Horace, of which he published a catalogue; as an anatomist he had demonstrated Douglas's pouch; as an obstetrician, he has been immortalized by Pope:

"There all the learned shall at the labour stand,
And Douglas lend his soft obstetric hand."

By reason of Douglas's assistance Hunter was entered as a surgeon's pupil at St. George's Hospital under Mr. James Wilkie, and as a dissecting pupil under Dr. Frank Nichols, who had a fine reputation as a teacher of anatomy. As evidence of his rapid progress in the study of anatomy Hunter read a paper in 1743 before the Royal Society entitled "An Essay on the Structures and Diseases of Articulating Cartilages."

In the winter of 1746 Hunter was asked to give a course of lectures on surgery to a society of navy surgeons. This experience proved to be the foundation of his great and abiding interest in teaching. It was also the income from these first lectures which started him on the way to amassing his large personal fortune, all of which he expended for medical purposes.

The Corporation of Surgeons admitted Hunter as a member in 1747; and in the following year, during a tour of the continent, he met in Leyden the famous Albinus who demonstrated his injected anatomic specimens.

According to Findley (5), "There were no lying-in hospitals in London until 1739 when a ward was set apart for parturient women in the St. James Infirmary where students were instructed by Manningham (Sir Richard)." Sir Richard Manningham and Dr. Francis Sandys shared the most lucrative part of the London practice of midwifery. Soon after Hunter began to be known in this field Sir Richard died and Dr. Sandys retired. These circumstances, according to Simmons (17), in part accounted for the rapid and successful establishment of Hunter in the practice of midwifery. In 1748 Hunter was appointed accoucheur to the Middlesex Hospital, and in 1749 he was made surgeon to the British Lying-in Hospital.

Because of William Hunter's aversion to surgery, and because in 1750 he obtained the degree of Doctor of Physic from the University of Glasgow, he began to practice as a physician. Until that time he had continued to live with the Douglas family but then moved to Jermyn Street.

In 1751 Hunter was admitted to the Faculty of Physicians and Surgeons of Glasgow. It was in this year that he inherited Long Calderwood upon the death of his brother, James. After this trip to Scotland he was seldom absent from London. In 1756 he became a licentiate of the Royal College of Physicians of London.

For the next twelve years Hunter apparently was occupied by his practice, teaching, anatomic studies, and writing. From 1762 to 1764 he was vigorously engaged in controversy concerning his claim to certain anatomic discoveries. One of his famous opponents was Professor Monro, Sr. His defense of his claims took the form of a work entitled "Medical Commentaries," which was supplemented as the occasion required.

Also, in the year 1762 Hunter was called as consultant in the pregnancy of Queen Charlotte, and thereby became the first man to attend a queen in any country (1). This circumstance established him as an accoucheur. The Royal Society granted him Fellowship in 1767. In 1768 Hunter built his house, lecture theatres, dissecting rooms, and museum in Great Windmill Street. Since he was becoming increasingly busy he engaged Mr. William Hewson, F.R.S., first as an assistant and later as a partner in his lectures. This association continued until 1770, when certain disputes arose. Mr. Cruikshank then became a partner.

William Hunter's greatest work, "The Anatomy of the Human Gravid Uterus (10)," was published in 1774 by the Baskerville Press. The result of about thirty years of intensive work, the book is an immortal monument to its author and to those artists and friends who helped to make it. In 1781 he became President of the Society of Physicians of London, and in 1782 was elected Foreign Associate of the Royal Academy of Sciences of Paris.

In spite of his abstemious manner of living, William Hunter was harassed by gout. He died apparently of a stroke on Sunday, March 30, 1783.

This brief biographic sketch fails to do justice to the attainments of so great a man as William Hunter, nor does it provide an intimate picture of his character or personality. A reproduction of a portrait appears as Figure 1. According to some writers (2), Hunter was of a jealous nature and needlessly controversial. However, Simmons (17), who knew him personally, wrote that Dr. Cullen said, "... that his conversation was remarkably lively and agreeable, and his whole conduct at the same time more strictly and steadily correct than that of any other young person he had ever known. The same cheerfulness and the same regard for prudence accompanied him through life."

Hunter's medical philosophy can be summed up in a sentence of his quoted by Teacher (20), namely: "Anatomy is the only solid foundation for medicine." The hopes of a less steady man than Hunter would have been destroyed by the death of his benefactor, James Douglas, in a little less than



William Hunter

FIG. 1. PORTRAIT OF WILLIAM HUNTER
(From the "Asclepiad")

a year from the beginning of their association. About this loss to Hunter, which occurred at so critical a period, Simmons said, "But he seems by this time to have had a consciousness of the superiority of his talents, and he who feels himself equal to great things will not easily be dismayed." Among his English contemporaries were the surgeons Cheselden, Warner, Percival Potts, and Sir Caesar Hawkins; and the physicians Radcliffe, Richard Mead, John Fothergill, Thomas Dover, Heberden, and Lettsom.

Andrews (1) listed the following among Hunter's friends as proof that he had interests outside the profession: Reynolds, Hogarth, Gainsborough, and Johnson. Andrews also quoted Adams, who considered that Hunter "... was a polite scholar, an accomplished gentleman, a complete anatomist, and probably the most perfect demonstrator as well as lecturer the world has ever seen." Hunter's attitude toward teaching was epitomized in his own sentence, "A man may do infinitely more good to the public by teaching his art than practicing it (5)."

Hunter's intellectual honesty was demonstrated by the fact that he spoke of his own mistakes in his writings. Schumann (16) commented that, "The amazing thing about this great teacher was the paucity of his published work, at least from a quantitative standpoint. Aside from the 'Anatomy of the Human Gravid Uterus (7),' William Hunter published only a slim volume of 'Medical Commentaries' and several communications in the 'Medical Observations and Inquiries'; the 'Two Introductory Lectures' appeared posthumously. The splendid and complete lectures to which Hunter devoted himself so unsparingly for thirty-six years have been lost except in the surviving note books left by his students."

In addition to his large medical museum, over 400 of the specimens of which dealt with obstetrics, Hunter had a magnificent library and a large collection of coins. As has been said, "... he drank the cup of intellectual life with both hands (10)." The habit of the collector extended beyond the fields of anatomy, natural history and coins to his large collection of rare books. According to McCrae (10), William Hunter had in his library 2345 books published before 1600.

Andrews (1) reported that Hunter spent about 100,000 pounds sterling on his museum. Mitchell (11) referred to Hunter as a wealthy man in connection with the publication of his magnum opus. As an additional source of income beyond that from his practice, Simmons (17) furnished the following statement: "The profits of his two first courses were considerable, but by contributing to the wants of different friends, he found himself at the return of the next season obliged to defer his lectures for a fortnight, merely because he had not money enough to defray the necessary expense of advertisements. This circumstance, which he mentioned to me, taught him to be more reserved in this respect, particularly as he found that by thus dis-

trekking himself, he had only encouraged the idleness of his companions. As he always had an aversion to borrowing, he now determined to be cautious of lending money, and by adhering to this prudent rule, and strict economy, he was afterwards enabled to amass that great fortune of which he made so liberal a use."

That there were controversies between the brothers William and John Hunter must be admitted. However, William was perfectly frank in the preface to his great work (7) in saying that in most of the dissections he had been assisted by his brother, Mr. John Hunter, "... whose accuracy in anatomical researches is so well known, that to omit this opportunity of thanking him for that assistance would be in some measure to disregard the future reputation of the work itself."

The obstetric accomplishments of William Hunter are of interest in connection with a study of his life and his magnum opus. As a background, Shumann (16) gave the following picture of British obstetrics of the eighteenth century:

"British obstetricians of the 18th century had reached a high standard of technical and scientific attainment—Smellie was at the height of his powers. White of Manchester had published his advanced views on puerperal sepsis. Sir Fielding Ould had exalted obstetrics in Ireland and invented episiotomy. Thomas Denman had developed the principle of induction of premature labor in the management of delivery in women with contracted pelves, and William Hunter published his monumental and enduring work 'The Anatomy of the Gravid Uterus.'

"Among this group of pioneers in the subject of midwifery, Hunter was by far the most important teacher and his series of lectures, while covering the entire medical curriculum, included a detailed and advanced course on obstetrics."

Teacher (20) wrote that, "In the field of obstetrical practice he shares with Smellie the credit of rescuing midwifery in England from the clutches of ignorant and superstitious midwives, placing it in the hands of properly qualified educated medical practitioners and giving it a sound basis of correct anatomy and physiology."

William Hunter was aware that his pronouncements in regard to the separate nature of the fetal and maternal circulations were not, strictly speaking, a new discovery. Harvey had said, about one hundred years before, that there was no mixing of the two bloods. Four years after the death of Harvey, Walter Needham published a fairly accurate description of the human placenta and a good description of the blood vessels in the wall of the pregnant uterus. However, it remained for Hunter to provide the actual anatomic proof. In a case of fatal hemorrhage from placenta previa (Fig. 3) Hunter described the complete absence of blood from the mother's

vessels, whereas those of the baby were found full of blood. Hunter's injected specimens proved beyond doubt the independence of the circulations. John Hunter undoubtedly played an important part in this work on fetal and maternal circulation.

The common practice in the management of the third stage of labor in England at the time when Hunter began his practice of midwifery was to quickly remove the placenta manually if necessary, before the cervix closed and thereby imprisoned the placenta. In this regard Hunter is quoted (1) as saying, "The hurrying away of the placenta is just as bad as hurrying on the labour, and forcing away the placenta is a terrible practice . . . nature does work much better for the mother and child than art, therefore, no force should be used . . . I know this to be an improvement of infinite consequences. . . . In hurrying away the placenta, parts of it are apt to be left behind or mischief done to the womb If I were allowed to give an account of myself, I may say I have never been of more service to mankind than in making this my practice and advice. Therefore, leave ye placenta always to nature." According to Andrews (1), "It is impossible to exaggerate the value of this teaching of Hunter's when we consider the terrible danger that must have attended the insertion of a hand into the uterus as a routine practice in preantiseptic days."

From the obstetric lectures of Hunter (16) one learns that he was extremely conservative. His advice in the management of a breech delivery is thoroughly modern. In the treatment of placenta previa he advocated waiting for normal labor or, in the presence of severe bleeding, he advised immediate delivery. Convulsions were treated by large doses of opium and by bleeding; and if the case was severe he advised rapid delivery. His dynamic manner of teaching is evidenced by the following statements found in the lecture notes of one of his students (1): "A contracted uterus can no more be inverted than a stiff jack-boot, but when it is soft and relaxed you may invert it." "There are two things at the time of labour which I am frightened at (all the others I do not care a sixpence for), one is a flooding and the other convulsions." In answer to the prevalent idea that a child born at the seventh month of gestation would have a better chance to survive than at eight months, Hunter simply said, "At seven months, a child may live, but it generally dies; at eight months most children live as well as at nine." Hunter's instructions to his students as to the management of labor were clear and concise.

With regard to the use of the obstetric forceps (1) Hunter was usually conservative. He insisted on the importance of allowing moulding to take place, and of making traction in the axis of the pelvis. His own feelings were decidedly expressive. "In few cases, I think the forceps an useful instrument; to a poor woman that is quite exhausted they may be of con-

siderable service, but I wish to God they had never been contrived. I am convinced that the forceps has killed three—I may say ten—women to one that it has saved, and therefore, we should never use it on any occasion but where it is absolutely necessary (1).”

So convincing was his argument against the operation of symphysiotomy that it never gained favor in England (5).

Andrews (1) wrote that Hunter described in a living woman “. . . a band of the inner stratum of the flesh of the uterus had not stretched in the same degree with the rest, but made a considerable partition internally; a circumstance which might have increased the difficulty, as well as the danger, of rudely turning the child, or taking away the placenta with the hand.” (“Anatomical Description of the Human Gravid Uterus and its Contents,” page 5). Andrews further reported that Smellie in 1743 recorded a similar case and felt that these cases referred to a contraction ring.

Although Hunter did not know the cause of puerperal infection he greatly feared it. In one of his lectures he said, “After labour there is nothing more common or terrible than what is called childbed fever (20).” In these lectures one gathers that Hunter felt that the entrance of air into the vagina might produce this fever. However, Peachey (14) was convinced that Hunter anticipated Holmes and Semmelweis for he says, “He appears to me to have grasped the significance of the principle that, for the safety of the women he attended, his practice should not be conducted from premises which served at the same time for anatomical purposes. This is corroborated by the fact that during the winter of 1761 and the spring and autumn of 1762, while he was in attendance upon Queen Charlotte, even his lectures were abandoned and there can be little doubt that he anticipated by nearly 100 years the observations of Oliver Wendell Holmes and Semmelweis attributing puerperal fever to the carriage of sepsis from attendant to patient.” It is known that Hunter described pelvic abscess, and on autopsy found peritonitis and adhesions in cases of childbed fever.

Hunter's chief obstetric contributions, however, were anatomic in the form of his magnum opus (7) in which he described his original and fundamental work on the decidua reflexa and retroversion of the pregnant uterus.

In addition to his obstetric accomplishments, William Hunter made important observations in other fields of medicine. According to Findley (5), “Of his many researches in anatomy, the greatest is his work on the lymphatic system, a contribution that ranks only second to Harvey's discovery of the circulation of the blood. William proved that the lymphatic vessels were not continuous with the blood vessels as taught by his predecessors, but were absorbent vessels emanating from all surfaces of the body, quite distinct from the blood capillaries.”

Hunter described aneurysmal tumors more carefully than any previous author, and was the first to describe arteriovenous aneurysm. According

to Garrison (6), he wrote papers of permanent value on old dislocations of the shoulders, the jurisprudence of infanticide, and the history of anatomy. He also wrote on the subjects of comparative anatomy, malformations, the cellular membrane, venereal disease, embryology, and natural history. He was one of the first to suggest the feasibility of tapping large ovarian cysts, and the first to propose actual excision.

Every obstetrician interested in the history of his specialty hopes to own a copy of William Hunter's monumental work, "The Anatomy of the Human Gravid Uterus (7)." It was with considerable pleasure, therefore, that the writer secured a copy of this work from the library of Dr. Howard A. Kelly. It appeared as item No. 1066 in the sixth catalog of this great library issued in September, 1941. The present copy is bound in marbled boards, half cloth, and measures $18\frac{3}{4}$ by $24\frac{3}{4}$ inches over-all. Books of this size are spoken of as elephant or atlas folios. The paper is slightly foxed and there are water stains on some pages about the depth of the margin. On the title page (Fig. 2) were found in heavy blue crayon the bold numerals "243," obviously an auction mark made by some clerk who had no regard for old books. It is the first edition of 1774 published by the Baskerville Press in Birmingham, and is No. 3026 in "Bibliotheca Osleriana (12)." There are thirty-four copper plate engravings, and the letterpress is in Latin and English with the titles of the plates in Latin. There are seventeen leaves or thirty-four pages of text. In a personal communication Dr. Kelly (13) informed the writer, "I bought Hunter's book somewhere about the turn of the century, long enough ago for the interval which has elapsed to have obliterated all memory of any further data." The work was published at six guineas.

By authors who have written of William Hunter this work has been variously referred to as *immortal*, *monumental*, *magnificent* and, *great*, but none of these adjectives, in the opinion of the writer, is extravagant enough. It is between the covers of this book that for the first time the decidua reflexa was described and the entity of retroversion of the pregnant uterus was recorded. It contains the basis of modern knowledge of placental anatomy. Here the anatomic proof of the fact of separate maternal and fetal circulations was established. Duncan (4) said that this book was, "... one of the staple foundations of the science and art of midwifery, and cannot fail in all future ages to be as valuable and useful as it is now." Richardson (15) wrote that, "There was, perhaps, never a book published by any one physician on which longer and severer labour was bestowed." Some writers have said that the work required twenty-five years for completion, and still others have felt that thirty years were necessary. However, it is known that the work was begun about 1751 and was published on November 15, 1774.

In speaking of the engravings, Choulant (3) said, "These 34 copper plates

A N A T O M I A
 U T E R I H U M A N I G R A V I D I
 T A B U L I S I L L U S T R A T A.

A U C T O R E

G U L I E L M O H U N T E R,

SERENISSIMAE REGINAE CHARLOTTAE MEDICO EXTRAORDINARIO,
 IN ACADEMIA REGALI ANATOMIAE PROFESSORE,
 ET SOCIETATUM, REGIAE ET ANTIQUARIAE, SOCIO.

BIRMINGHAMIAE EXCUDEBAT JOANNES BASKERVILLE, MDCCLXXIV.

LONDINI PROSTANT APUD S. BAKER, T. CADELL, D. WILSON, G. NICOL, ET J. MURRAY.

T H E A N A T O M Y
 O F T H E
 H U M A N G R A V I D U T E R U S
 E X H I B I T E D I N F I G U R E S.

B Y

W I L L I A M H U N T E R,

PHYSICIAN EXTRAORDINARY TO THE QUEEN, PROFESSOR OF
 ANATOMY IN THE ROYAL ACADEMY, AND FELLOW OF THE
 ROYAL AND ANTIQUARIAN SOCIETIES.

PRINTED AT BIRMINGHAM BY JOHN BASKERVILLE, 1774.
 SOLD IN LONDON BY S. BAKER AND G. LEIGH, in York-Street; T. CADELL in the Strand; D. WILSON AND G. NICOL,
 OPPOSITE York-Buildings; AND J. MURRAY, in Fleet-Street.

FIG. 2. TITLE PAGE, ANATOMIA UTERI HUMANI GRAVIDI

represent the gravid uterus and its contents in life-size, anatomically exact, and artistically perfect." One must actually see these plates to appreciate the truth of this statement. The Dutch artist, J. van Rymdyk, made all but three of the drawings for this work, and they were made from the dissection of thirteen bodies as well as several abortions. Hunter insisted that the artist make his drawings from the specimens and not, as did some of the contemporary artists, from memory or imagination. The excellent dissections show the fetus in utero, the arrangement of the musculature of the uterus, and the relationships of the decidua. The plates were engraved by eighteen of the leading artists in this field, the foremost of whom was Sir Robert Strange, who personally engraved plates IV and VI and who supervised most of the others. Hunter made special mention of his friend, Sir Robert, in the preface. Mitchell (11) expressed the opinion that William Hunter's masterpiece bears the same relation to obstetrics that "*De Corporis Humani Fabrica*" of Vesalius does to anatomy.

Straus and Dent (18) wrote that the work was reprinted in 1828 from lithographic transfers, and in 1851 by Day and Sons for the Sydenham Society. However, Mitchell (11) claimed that in 1815 a second edition was printed by Messrs. Cox of the Borough, London, who had bought the copyright from Matthew Baille; that in 1851 a third edition was issued by the Sydenham Society, in folio, the pages being doubled; and that the work was also copied full size in Caldanis "*Incones Anatomicae*", Vol. 3, Venice, 1810.

After dedicating the work to the King, Hunter (7) showed the breadth of his knowledge and culture in his preface by saying, "The art of engraving supplies us, upon many occasions, with what has been the great desideratum of the lovers of science, an universal language."

In his magnum opus Hunter gave his account of the existence of the membrana decidua reflexa. According to Teacher (20), "... the nature, origin, and anatomical relations of the decidua are here described and figured as well as they are now or can be." Hunter "... described the placenta as being composed of two parts, the one, uterine, being decidual, the other fetal, being formed by the prolongations of the branchings of the vessels of the umbilical cord (1)." He asserted that the decidua forms the uterine part of the secundines; that the decidua reflexa is continuous with the decidua vera and that it is permeated by vessels. Thoms (21) said that Hunter was the first to give an accurate description of the decidua reflexa. Even in regard to the decidua, John and William Hunter were not in complete agreement. It is interesting to note the statement of Findley (5) in this controversy: "John contended that the inner lining of the pregnant uterus was the product of inflammation but William, calling it the decidua, held that it was nothing more than the hypertrophied mucous membrane."

Castiglioni (2), Richardson (15), Garrison (6), and Duncan (4) referred to

Hunter's work on retroversion of the uterus, while Teacher (20) and Andrews (1) specifically claimed that his work dealt with retroversion of the gravid uterus. Until Hunter's time this condition was apparently unrecognized, and he also indicated the means of diagnosing and treating it. He did not advise emptying the uterus in treating this condition, as did many of his contemporaries.

In 1794, eleven years after Hunter's death, his nephew Matthew Baille published his other chief anatomic work, "An Anatomical Description of the Human Gravid Uterus and Its Contents," which Hunter had left as an unfinished manuscript. He had intended this to be a detailed description of the anatomy and physiology of the parts described in his atlas folio. Unfortunately, many of Baille's own notions became incorporated in this book.

It would be a serious omission to close this paper without some mention of the famous press from which Hunter's "Anatomia Uteri Humani Gravidi" came, and its publisher, John Baskerville. The book is the only medical publication of the celebrated Baskerville press. John Baskerville was the foremost printer of that age, and while the letterpress of Hunter's great work occupied the last months of his life, none of his craftsmanship was impaired. Stephen (19) said, "In spite of repeated efforts to get rid of his printing business, love of the art in the end proved stronger than dislike of pecuniary loss. Baskerville went on printing nearly to the last months of life, and one of the latest works produced under his care was the letterpress of Dr. William Hunter's great work on the human gravid uterus, 1774." According to Mitchell (11), "Baskerville is deservedly ranked among the foremost of those who have advanced the art of printing. . . . Specimens from the Baskerville press are not easily had and are of considerable value The additional expense of Mr. Baskerville's art was not incurred for the sake of elegance alone; but principally for the advantage of his paper and ink; which render a leaf of his presswork an excellent preservative of the plates between which it is placed." Hunter praised Baskerville in his preface, and Mitchell (11) wrote that, "Time has shown that the praise is highly deserved, for after more than a century and a half the paper is still firm and the printing is as clear as when it first came off the press."

The munificence in the cause of science which Hunter exhibited by devoting most of his large income to medical purposes is illustrated by his magnum opus. "The expense must have been enormous, for not only was the press work executed, as already mentioned, by the foremost printer of that age, but the drawings were made by J. van Rymsdyk, a Dutch artist with a very considerable reputation, and the plates were engraved by the leading artists in this line, headed by Mr., afterward Sir Robert, Strange. None but a wealthy man endowed with good taste could have produced such a volume (11)."



Tab. XII. ab eodem, qui præcedens, muliere, exhibet apertam planè a parte postera uterum cum vagina, quo situs fœtus, partisque inf. rior Placentæ sub ruitus capite indicantur. Placentæ adhuc orificiæ uteri interno adheret, et quæ sub faciem graviditatis dilatata, fœtali inde divisione separata est.

FIG. 3. PLATE XII, ANATOMIA UTERI HUMANI GRAVIDI

Mitchell paid the following tribute to William Hunter and his most famous work: "The volume portrays the character of the author; his unwearied perseverance, extreme accuracy and good taste, and his passion for exact truth which led him to have the plates made not as diagrams to explain any theories of his own, but to be strict representations of the actual dissections. William Hunter needs no other monument than this immortal work."

BIBLIOGRAPHY

- (1) ANDREWS, HENRY RUSSELL: William Hunter and His Work in Midwifery. *Brit. Med. Jour.*, **1**: 277, 1915.
- (2) CASTIGLIONI, ARTURO: A History of Medicine, p. 626. Alfred Knopf, Inc., New York City, 1941.
- (3) CHOULANT, LUDWIG: History and Bibliography of Anatomic Illustration, translated and edited by Mortimer Frank, p. 296. University of Chicago Press, Chicago, 1920.
- (4) DUNCAN, J. MATTHEWS: William Hunter. *Edinburgh Med. Jour.*, **21**: Pt. II, 1061, 1876.
- (5) FINDLEY, PALMER: Priests of Lucina, p. 178. Little Brown & Co., Boston, 1939.
- (6) GARRISON, FIELDING H.: An Introduction to the History of Medicine, ed. ⁴, p. 339. W. B. Saunders Co., Philadelphia, 1929.
- (7) HUNTER, WILLIAM: Anatomy of the Human Gravid Uterus. Baskerville Press, Birmingham, England, 1774.
- (8) JAMESON, EDWIN M.: *Clio Medica Gynecology and Obstetrics*, p. 50. Paul B. Hoeber, Inc., New York City, 1936.
- (9) LEE, SIDNEY: Dictionary of National Biography, **27**: 302. Smith, Elder Co., London, and Macmillan Co., New York City, 1891.
- (10) McCRAE, THOMAS: William and John Hunter. *Ann. Med. History*, **4**: 175, 1922.
- (11) MITCHELL, ROSS: William Hunter's Anatomy of the Gravid Uterus. *Can. Med. Jour.*, **17**: 1379, 1927.
- (12) OSLER, WILLIAM: *Bibliotheca Osleriana*, p. 272. Clarendon Press, Oxford, 1929.
- (13) KELLY, HOWARD A.: Personal communication.
- (14) PEACHEY, GEORGE C.: William Hunter's Obstetrical Career. *Ann. Med. History*, new series, **2**: 476, 1930.
- (15) RICHARDSON, BENJAMIN WARD: William Hunter. *Asclepiad*, **5**: 339, 1888.
- (16) SCHUMANN, EDWARD A.: William Hunter Lecturing on Obstetrics and Infant Care. *Tr. and Stud. Coll. of Phys. of Philadelphia*, series 4, **9**: 155, 1941.
- (17) SIMMONS, SAMUEL F.: An Account of the Life and Writings of the Late William Hunter. W. Richardson, London, 1783.
- (18) STRAUS, RALPH AND DENT, ROBERT K.: John Baskerville, A Memoir, p. 62. University Press, Cambridge, England, 1907.
- (19) STEPHEN, LESLIE: Dictionary of National Biography, **3**: 361. Smith Elder Co., London, 1885.
- (20) TEACHER, JOHN H.: William Hunter, Anatomist. *Glasgow Med. Jour.*, **52**: 15, 1899.
- (21) THOMS, HERBERT: Classical Contributions to Obstetrics and Gynecology, p. 15. Charles C. Thomas, Baltimore, 1935.

"A BIBLICAL PORTRAIT OF OLD AGE"*†

LOUIS A. M. KRAUSE, M.D.

BALTIMORE, MD.

"And, by these, my son, be admonished: of making many books, there is no end; and such study is a weariness of the flesh. . . ." *Ecclesiastes*

With this warning every writer is challenged to justify himself in adding anything in print or rushing into print. It is with the purpose of familiarizing a greater number, particularly doctors, with a beautiful description of aging written in classical prose in the Bible that this is written. This quotation is found in the book of Ecclesiastes in Hebrew, "Koheleth," written about 200 years before Christ. The author of the book was probably not a theologian but a citizen of the world with some medical education, a keen power of observation, penetrating insight, and a tremendous experience. He apparently was a Jewish noble living in Jerusalem and may have been a son of David in the same sense as Hillel and Jesus. The genuine portions of the book of Ecclesiastes are Sadducean and Epicurean.

The author cannot perhaps be best appreciated until one is seventy and it can be safely assumed that he reached the psalmist's three score and ten before he finished his work. The price this book paid for being included in the Sacred Writing probably resulted in its being misunderstood or, more likely, intentionally modified so as to mask its original meaning. Medical men are interested chiefly in the twelfth chapter. Here is a true, medically accurate portrait of old age. The changes wrought by time are seen step by step, year after year, and generation after generation. This interpretation, as a series of metaphors, describes the failing functions of all organs, with the final return of this earthly house to dust, "for dust thou art and unto dust thou shalt return."

The writer of this word picture is designated in the Hebrew as Koheleth, the underlying stem of which word means an assemblyman. This apparently was his nom de plume. The Greek translators in the Septuagint about 100 B.C. rendered the Hebrew name into Ecclesia, which means an assembly. In English the name is defined as Ecclesiastes, which term likewise gives no hint of the contents of the manuscript. The book is not only intensely human but extremely modern and will never grow old in spirit. It belongs to the great class of wisdom literature of the Bible. However, it does not reach the heights of the Book of Job. It offers no

* From the Department of Medicine, School of Medicine, University of Maryland.

† Received for publication June 2, 1942.

great religious theme such as is found in the idea of disinterested religion or "fearing God for nought" which is Job's ideal.

"Remember now thy Creator in the days of thy youth, while the evil days come not, nor the years draw nigh when thou shalt say, I have no pleasure in them." Verse 1.

Here the author is apparently addressing himself to a group of young people when life still has many pleasures for them, when there are few evil days and interest in life is still present.

"While the sun, or the light or the moon or the stars, be not darkened; nor the clouds return after the rain." Verse 2.

"The sun or light, the moon or stars" refers to the sunshine of youth when everything is bright and happy. As one grows older, more and more the number of rainy days increases until in old age there is no sunshine after a storm or rain but everything remains dull and gray. How well is remembered the depression era when many elderly persons lost their jobs and savings only to face a bleak old age without sunshine after the storm.

"In the day when the keepers of the house shall tremble, and the strong men shall bow themselves, and the grinders cease because they are few, and those that look out of the windows be darkened." Verse 3.

In Oriental literature the human body is frequently referred to as a house or temple (John 2, 21, Cor. 3, 16). With this imagery the keepers of the house mean the hands. It is well known that the hands tremble in old age because of sclerosis and paralysis agitans, and the "strong men" refers to the hips and legs (Talmud, Sabbath 152). It is true that there is frequently a bowing of the legs and flaring out of the hips in old age without assuming the occurrence of Paget's disease or osteitis deformans. The grinders so clearly refer to teeth that no explanation is needed, and that they become fewer as one grows older is well known. "Those that look out of the windows be darkened"—here again the imagery of the East refers to the eyes, the increasing dimness of vision with age, presbyopia, and later cataracts. The statement compares the eyes with individuals sitting in their houses and looking out of the windows, and remind one of the Oriental ladies sitting behind their lattice walls.

"And the doors shall be shut in the street, when the sound of the grinding is low, and he shall rise up at the voice of the bird, and all the daughters of music shall be brought low." Verse 4.

The word "doors" of the body implies the ears, because the following clause refers to "sound of the grinding is low" and clearly applies to the time when there are not enough teeth to make a noise of grinding. If one

wants to reduce noise from the outside street, the doors must be closed. The old reference in the Talmud suggesting that doors mean the bowels is not plausible from a medical point of view. Constipation does not increase with age. Also, the Hebrew word for ears is the dual form which indicates two.

"He shall rise up at the voice of the bird" expresses the difficulty of old people to sleep soundly, contrasted with the ease of young people to sleep; "and all the daughters of music shall be brought low" is the Eastern equivalent of the pleasures of life. Few persons in their sixth and seventh decades find interest in night clubs and similar forms of pleasure.

"Also when they shall be afraid of that which is high, and fears shall be in the way, and the almond tree shall flourish, and the grasshopper shall be a burden, and desire shall fail; because man goeth to his long home and the mourners go about the streets." Verse 5.

The language here in the Hebrew is decidedly uncertain. One must be guided by the sense of the verse. The caution of old people is implied together with their fear of high places. It should be borne in mind, however, while the adage "Young men for action, old men for judgment" is true, it is the lack of caution in young men that prevents many from becoming old. "And the almond tree shall flourish." Close at hand the almond tree blossoms are pale pink at their base but in the distance they appear white. Here the author refers to gray hair coming on with age. "The grasshopper shall be a burden" refers to sex ability. In the Talmud (Sabbath 152) the grasshopper is a picture for the male member. In the text this statement is followed by the explanative clause, "desire shall fail," apparently limiting the meaning to sex ability. Once again the text is obscure and one must depend on the implications. The verse ends with the reference to death and the return to the house of eternity. "The mourners go about the street" is familiar to one who has been in the East where it is the custom of hired mourners to follow the funeral procession, wail loudly, and dramatically express grief.

"Or ever the silver cord be loosed, or the golden bowl be broken, or the pitcher be broken at the fountain, or the wheel broken at the cistern." Verse 6.

This verse refers to the spinal cord of the body as the silver cord, or possibly to the spinal column. Either it is to be understood as the stooping gait of the old man, or the loss of coordination in movements curtailed by the decrease in alertness, or by slow reflexes. One prefers to think about the uncertainty of the old man's gait. A greater number of old people are admitted to the accident rooms of hospitals on a slippery, sleety winter night because of slipping. Few youngsters suffer such mishaps. "The

golden bowl be broken" may mean either the brain or heart, the brain losing its power with age or the occurrence of apoplexy. "The pitcher be broken at the fountain"—here it is too hazardous to read into the meaning. Undoubtedly it refers to the organs of excretions, such as the intestines and urinary organs. From the strict medical point of view it would suggest the kidneys as the fountain, with their failure in old age. With regard to the last clause, "the wheel broken at the cistern," knowledge of the water-wheel as used in the Orient suggests the difficulty of the urinary bladder in old age, in men with prostatism or obstruction, and in women with incontinence.

"Then shall the dust return to the earth as it was; and the spirit shall return unto God who gave it." Verse 7.

After all this happens then truly the house, the body, shall return unto God who gave it.

"Vanity of vanities, saith the preacher; all is vanity." Verse 8.

The author is modern and handles with great literary skill the vicissitudes of human life, which are always the same. He is at times painfully frank when he portrays the mirror of life. In spite of that he is only mildly cynical, never a pessimist. He loves life and has a great deal of sympathy for suffering humanity. He is no theorizing philosopher building a system of thought; rather he prefers with a twinkling of his eye to unfold his views of life, the result of a long and varied experience. The human interest of the book is all the more intense because of its main conclusion, that life is a paradox.

It should be borne in mind that this portion of the Holy Scripture is one of the most difficult to translate because of the obscurity and corruption of the text. It is also extremely difficult to say what is original and what has been added or changed, if anything. Frequently the ancient writer would borrow a favorite expression or thought and imbed it into his own writings. The difficulty of the translator and interpreter is consequently made greater.

The interpretation of this chapter does not alter one's belief in the Bible but only one's belief about the Bible. The religious truths embodied in the Bible are independent of questions of text, origin and composition.

BIBLIOGRAPHY

- (1) The Bible.
- (2) The Talmud.
- (3) HAUPT, PAUL: *Ecclesiastes*. Johns Hopkins Press, Baltimore, 1905.
- (4) JASTROW, MORRIS, JR.: *A Gentle Cynic*. J. B. Lippincott Co., Philadelphia, 1919.

ITEMS

Mr. Charles McManus of Baltimore has awarded a grant of \$7500 to Dr. John C. Krantz, Jr., Professor of Pharmacology of the School of Medicine of the University of Maryland. The money is the third of a series of grants received from Mr. McManus for the purpose of studying the pharmacology of arthritis and the use of various drugs in the treatment of this disease.

Dr. Howard M. Bubert, Assistant Professor of Medicine, has been appointed executive chairman in charge of all disaster preparedness and relief operations in the territory of the Baltimore Red Cross Chapter.

Dr. O. Costa Mandry, Class of 1921, recently reported the following appointments to positions of high merit in Puerto Rico:

Dr. Pablo Morales Otero, Class of 1919, director of the School of Tropical Medicine;

Dr. Antonio Fernós Isern, P. & S. 1915, Commissioner of Health of Puerto Rico;

Dr. Juan Nogueras, P. & S. 1915, Assistant Commissioner of Health;

Dr. Rafael Vilar, Class of 1929, director of the Public Health Division in the Department of Health of Puerto Rico.

Dr. Mandry is director of the Public Health Laboratories and is in charge of the direction of medical services in civilian defense.

ACTIVITIES OF THE CORDELL HISTORICAL SOCIETY OF THE UNIVERSITY OF MARYLAND

PEDIATRIC ANTIQUE DISPLAY

Under the auspices of the Cordell Historical Society an unusual exhibit of pediatric antiques was loaned by the Mead Johnson Company of Evansville, Indiana for display in the Medical Library during the month of September. The collection consisted of over forty pieces and included an assortment of items ranging from prehistoric clay nursing bottles to pewter feeding spoons of nineteenth century English design.

OBITUARIES

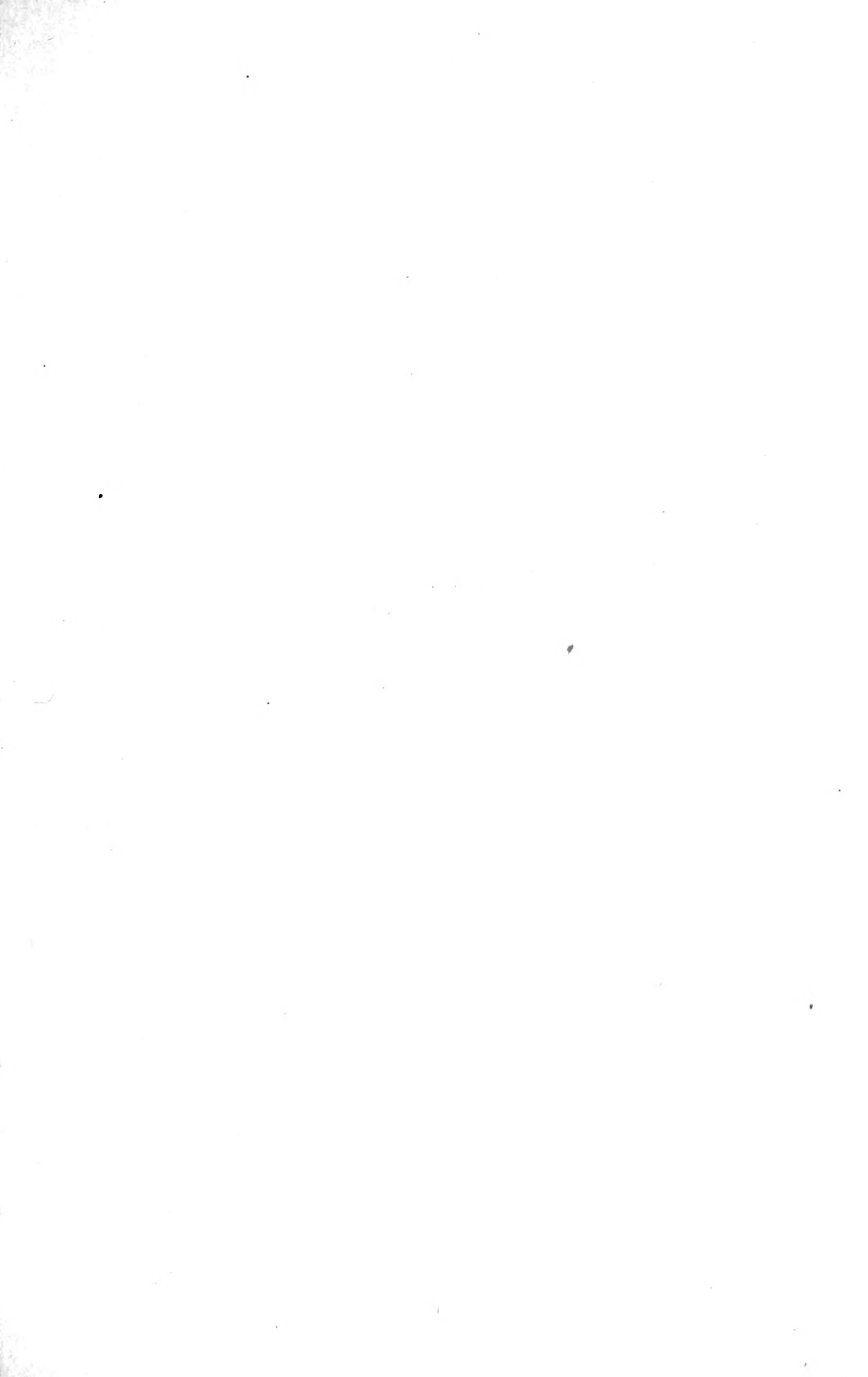
- Ashcraft, Alva M.**, Leesville, Ohio; B.M.C., class of 1903; aged 61; died, April 29, 1942, of diabetic gangrene.
- Brogden, M. L.**, Wagner, S. C.; class of 1909; died, June 1, 1942, of Bright's disease and heart trouble.
- Carey, Robert Starke**, Washington, D. C.; class of 1908; aged 65; died, June 1, 1942.
- Creighton, Lawrence C.**, Unity, Pa.; P. & S., class of 1908; aged 62; died, May 3, 1942, of chronic valvular heart disease.
- DeBlois, Seth**, Newport, R. I.; class of 1905; aged 59; died, April 26, 1942, of coronary thrombosis.
- Fahndrich, Carl Gustav**, Battle Creek, Mich.; class of 1920; aged 47; died, May 31, 1942.
- Finch, James Hugh**, Champaign, Ill.; P. & S., class of 1895, served during World War I; aged 71; died, April 21, 1942, of coronary thrombosis.
- Glass, George Frederick**, Cleveland, Ohio; P. & S., class of 1893; served during World War I; aged 73; died, April 27, 1942, of hypertensive cardiovascular disease.
- Grigsby, Clarence Manning**, Dallas, Texas; P. & S., class of 1893; aged 73; died, June 14, 1942, of hypertensive heart disease and angina pectoris.
- Kilgore, George Clinton**, Gloucester City, N. J.; B.M.C., class of 1895; aged 75; died, May 11, 1942, of laryngeal carcinoma.
- Larned, Charles Willis**, Baltimore, Md.; class of 1893; aged 72; died, June 4, 1942, of hypertensive cardiovascular disease.
- Lenker, Jesse Luther**, Harrisburg, Pa.; B.M.C., class of 1907; aged 59; served during World War I; died, June 2, 1942, of cerebral hemorrhage.
- Lynch, Thomas**, Waldorf, Md.; P. & S., class of 1881; aged 83; died, May 20, 1942.
- Martin, Sydnor Lee**, Leaksville, N. C.; B.M.C., class of 1892; aged 78; died, February 21, 1942.
- McAndrew, Joseph Theodore**, La Plata, Md.; class of 1929; aged 37; died, in May, 1942.
- Miller, William Edward**, Ludowici, Ga.; P. & S., class of 1898; aged 72; died, in April, 1942.
- Neff, Irwin Hoffman**, Detroit, Mich.; class of 1889; served during World War I; aged 73; died, May 11, 1942.
- Pilkey, Benjamin Charles**, Huron, Ohio; P. & S., class of 1896; served during World War I; aged 75; died, April 24, 1942, of chronic organic heart disease.

Sloan, Ira E., Johnstown, Pa.; B.M.C., class of 1892; died, February 6, 1942.

Westwood, David, Provo, Utah; P. & S., class of 1902; aged 71; died, March 8, 1942.

White, Elijah Wootton, Poolesville, Md.; class of 1906; aged 60; died, May 29, 1942, of coronary thrombosis.

Wissig, George Leroy, Baltimore, Md.; class of 1920; aged 44; died, August 12, 1942, of a heart attack.





DR. ROBERT U. PATTERSON

BULLETIN

OF THE

SCHOOL OF MEDICINE

UNIVERSITY OF MARYLAND

Vol. 27

JANUARY, 1943

No. 4

EDITORIAL

MAJ. GEN. ROBERT U. PATTERSON, USA (RETIRED), APPOINTED DEAN OF THE
SCHOOL OF MEDICINE AND SUPERINTENDENT OF THE HOSPITAL

Maj. Gen. Robert U. Patterson, USA (retired), former surgeon general of the army, has been named Dean of the School of Medicine, University of Maryland, and Superintendent of the University Hospital.

For the last few years Dr. Patterson has been dean of the University of Oklahoma School of Medicine and superintendent of the State University and Crippled Children's Hospitals at Oklahoma City.

Coincident with the announcement of Dr. Patterson's appointment, the Board of Regents of the University also announced a reorganization of the school and the hospital and a closer coordination of the hospital with the school as a combined teaching unit.

Dr. Patterson was a member of the United States Army from 1901 until 1935, when he was retired with the rank of major general. It was at that time that he became connected with the University of Oklahoma.

After concluding his internship at a Montreal hospital in 1900, he practiced in Montana for one year and then entered the Army with the grade of first lieutenant and was stationed at Fort McHenry.

During World War I he served as a colonel, and from 1931 to 1935 was surgeon general of the Army with the rank of major general.

Dr. Patterson has received numerous decorations, among them being the Distinguished Service Medal awarded for exceptionally meritorious service as commanding officer of his organization during World War I. He also is holder of two Silver Star citations and the Philippine Campaign Badge for service in the Philippines at the turn of the century.

Dr. Patterson also was mentioned in dispatches by Sir Douglas Haig, commander in chief of the British Expeditionary Forces, in 1917 for "gallantry on the western front."

The new Dean-Superintendent is a Fellow of the American Medical Association, the American College of Physicians, and the American College of Surgeons, and a member of the Association of Military Surgeons of the United States, the Oklahoma County Medical Association, and the Oklahoma State Medical Association.

Dr. Patterson is the author of a number of medical publications.

PHYSIOLOGIC ADJUSTMENTS TO THE STANDING POSTURE*†

WILLIAM R. AMBERSON, PH.D

BALTIMORE, MD.

THE POSTURAL PROBLEM

When man's subhuman ancestors first dared to rise and walk upon their hind legs they essayed a physiologic experiment of no mean difficulty. Blood, like water, runs downhill and, when held in vertical vessels, exerts a hydrostatic pressure fully equal to the height and weight of its columns. If the blood vessels were rigid tubes, impermeable to water, sudden changes in posture would make little difference. At every position arterial hydrostatic pressures would be exactly counter-balanced by equal venous forces, and the heart would be free to move blood around the circuit at unaltered rate. Actually such a vascular apparatus would be useless to our bodies and does not, in fact, exist. Instead the body is supplied with a system of elastic tubes, ringed round at crucial points with smooth muscle coats, whose state of contraction or relaxation greatly influences the speed of blood flow. They are permeable, in their finer subdivisions at least, to water, salts, and other dissolved material.

In such a vascular system the immediate effect of a sudden change from the recumbent to the upright position is a surge of blood downward from the head, arms and upper trunk to the lower trunk and legs. Blood which previously flowed easily and quickly back to the heart along horizontal venous channels must now climb more slowly over vertical distances of as much as a meter. A vertical meter of blood exerts a hydrostatic pressure downward of approximately the same value as the force developed by the left ventricle at the peak of its systole. In all subcardiac organs some measure of hydrostatic pressure will sum with the force of the heart beat to increase arterial values. Such heightened pressures increase the filtration head and cause the passage of more fluid out of the capillaries in the dependent parts. Less blood is thus available for the venous return, already embarrassed by the weight of the blood in the veins. Simultaneously the supply of adequate blood to the brain is made less easy.

Standing posture therefore poses a difficult problem for the mammalian organism. All mammalian species assume this position on occasion and all, in greater or less degree, appear to have developed compensatory reactions which at least partly adjust them to the state. In man and other primates this machinery of compensation has been most highly developed. It is

*From the Department of Physiology, School of Medicine, University of Maryland.

†Received for publication November 30, 1942.

still far from perfect, but on the whole man can claim success in his postural experiment. It is the purpose of this review to describe some of the mechanisms by which compensation is achieved, to consider certain costs of the upright position, and to describe a few of its immediate and remote consequences, as suggested by recent physiologic literature. The basic cardiovascular changes were considered long ago by Leonard Hill (23) and were extensively reviewed in 1938 by McDowall (37). Attention will therefore be confined mainly to papers published since that date.

BLOOD PRESSURE AND CARDIAC OUTPUT

After a sudden change from a recumbent to an upright position the brachial systolic blood pressure immediately falls. Wald, Guernsey, and Scott (49) observed declines of as much as 40 millimeters of mercury in their human subjects. At the same time diastolic pressures usually rise slightly. According to these observers the maximum drop in systolic pressure is noted in about ten seconds. Thereafter the pressure rises again and is back to the original level in about thirty seconds. In most normal people the systolic value then rises to exceed the original recumbent level by 5 to 10 millimeters of mercury.

Since brachial diastolic pressure either rises slightly or remains unchanged, it appears that the fall in the systolic value must result mainly from a decreased stroke volume of the heart rather than from a downward surge of arterial blood. Unfortunately, none of the methods now available makes it possible to follow cardiac stroke volume second by second immediately after the postural change. Even in the new vertical ballistocardiograph of Starr and Rawson (46) a minute or more must elapse before readings can be obtained in the upright position. By this time compensation is complete and the cardiac output is back to normal.

Some downward movement of arterial blood must indeed occur. But this arterial movement must be transient and checked almost at once by arteriolar vasoconstriction. At any rate, no one has been able to work fast enough on man to discern a phase of lowered diastolic pressure. It appears that compensation for the increased hydrostatic pressure is highly developed on the arterial side and is achieved by swiftly acting vasomotor reflex action.

On the venous side the situation is rather different. It is true that the venules and the veins are not utterly devoid of vasomotor control. A considerable literature (36, 37) testifies to the existence of a tonic vasoconstrictor control of these vessels, which may be either increased or diminished by nervous reflex action. But such vasomotor mechanisms are much less well developed than on the arterial side. Hence blood drains back into the veins with relatively little hindrance, save that offered by the valves in the

smaller vessels. The precipitous drop in arterial systolic pressure immediately after the postural change must be ascribed to this relative failure in the venous return.

According to Schneider and Crampton (44), McMichael (38), and Asmussen, Christensen, and Nielsen (2), venous return and cardiac output never are fully restored in quiet standing. Other investigators, including Grollman (17) and Goldbloom, Kramer, and Lieberman (16), have reported that on the average the values return to previous recumbent levels. Most recently Starr and Rawson (46), using their vertical ballistocardiograph, have measured stroke volumes and cardiac outputs in the horizontal position, then secured records vertically a minute or more later. On average the cardiac output is the same in the two positions. A decreased stroke volume, which regularly appears, is compensated by a more rapid beat, so that blood moved per minute is the same. These authors find, however, that persons with high cardiac outputs in the recumbent position usually show a diminution during quiet standing, whereas initially low output values are often succeeded by higher figures when the postural change is made. They suggest that apparent discrepancies in the literature may arise from a failure on the part of investigators to appreciate that a correlation exists between the magnitude of the recumbent cardiac output and the direction of the change in it induced by assumption of the upright posture.

The reasons for this correlation remain obscure. It seems clear, however, that practically all people are able to restore a normal or nearly normal venous return within half a minute after the postural change. Only rarely is orthostatic hypotension encountered as a definite clinical syndrome, although this phenomenon is common enough as a transient symptom when patients first leave their beds after a period of recumbency. Ellis and Haynes (12) and Jeffers, Montgomery, and Burton (25) considered it to be the result of a failure of the normal postural vasoconstrictor reflex. It is observed in subjects with *tabes dorsalis*, *syringomyelia*, and other diseases of the central nervous system.

Recent observations of Edholm (10) show that in cats the major part of the venous blood which fails to reach the heart when the animals are first placed in a vertical position drains back into the liver. According to this investigator systolic blood pressure no longer falls when the postural change is made, if only the liver has previously been removed. In man the lower extremities must also furnish a reservoir for part of the venous pool. They definitely swell, according to Youmans, Akeroyd, and Frank (52), but this increase in size is, of course, partly caused by the greater loss of fluid from the blood vessels to tissue spaces. Edholm reports that the splanchnic area shows marked vasoconstriction at the same time that the liver swells. It assists, therefore, in the compensatory process by which arterial drainage downward is circumvented.

THE MECHANISM OF ORTHOSTATIC VASOCONSTRICTION

The celerity of the compensatory reactions by which the human body adjusts its blood pressure after assumption of the erect posture is proof positive that nervous reflex actions are involved. A search has long been in progress for the sensory receptors involved in such reflexes. There is still some doubt concerning their location and nature. On the motor side it is becoming increasingly clear that the responses are not merely a matter of vasoconstriction in arteries or veins, but that the skeletal musculature has also an important rôle to play. The intervention of the skeletal muscles is, of course, evident when activity and movement accompany the upright position. To different degrees in different individuals, however, these muscles make a contribution even in quiet standing, as will shortly be discussed.

For the moment this larger aspect of the compensatory process may be neglected, and attention focused upon the mechanism of orthostatic vasoconstriction. There is no clear evidence that any part of the higher brain intervenes to produce it. Some years ago Camis (3) described a variety of vasomotor effects observed upon vestibular stimulation or ablation. In his experiments stimulation of the labyrinths, however induced, invariably led to vasodilation and a fall in blood pressure. He did not, however, specifically examine the possibility that the labyrinths might exert vasomotor influence after a change from a horizontal to a vertical position. A search of the literature has not revealed any more recent study of labyrinthine vasomotor reflexes. The matter deserves reconsideration in connection with the postural problem.

Other contributions to the production of orthostatic vasoconstriction might conceivably be made by various regions of the higher brain. The medullary cardiovascular centers are known to be under the control of hypothalamic mechanisms. Even the pyramidal tract, according to Tower (48), includes fibers which tonically excite vasodilation. Their activity might possibly change in the erect position. She also described pyramidal elements which stimulate the tonic contraction of skeletal muscle. There is no evidence that such neural mechanisms actually modify their influence on the heart or blood vessels during postural changes, but the possibility cannot be excluded.

When an examination is made of the vascular reflexes induced by pressoreceptors in the walls of the heart itself, or in the large arteries, clearer suggestions are secured concerning the mechanism of the phenomenon in question. In 1924 McDowall (35) described a pressor reflex from the right auricle, which is caused to operate by any condition which produces a fall in venous pressure. Such a fall occurs upon assuming the erect position. The sensory receptors involved lie in the walls of the chamber and the

reflex may be abolished either by vagus sections or by painting the auricle with cocaine. The later course of experiment and argument concerning this pressor reflex is discussed by McDowall in his more recent review. Its existence has been both confirmed and denied, but the present consensus of opinion is favorable. According to de Waele and Van de Velde (6), the vagus acts as a pathway of pressor impulses from other venous regions than the right auricle, since the rise of blood pressure brought about in the cat after occlusion of the portal vein does not occur if the vagi are cut. These same authors (7) have recently extended their observations to show that pressor fibers from the right auricle reach the vasoconstrictor centers in the medulla by way of the first, second, and third thoracic spinal roots as well as by way of the vagus. This observation may explain the fact that although double vagisection diminishes the intensity of orthostatic vasoconstriction it does not wholly abolish it.

The pressoreceptors of the large arteries also have a relation to the cardiovascular adjustments in standing, but the exact mechanism of their action is not yet clear. These sensory receptors lie in the arch of the aorta and in the vascular enlargement at the bifurcation of the common carotid known as the carotid sinus. They respond to increases in arterial blood pressure by sending volleys of nerve impulses to the medulla, which act to diminish or suppress the tonic activity of the vasoconstrictor center. The peripheral resistance is thus diminished and arterial blood pressure shortly falls. These receptor systems are therefore depressor in character and stand as guardians at the gateway to the brain to protect that organ against a too high blood pressure. Not only do they diminish vasoconstrictor tone but they also reflexly slow the heart and the respiratory movements.

These arterial pressoreceptors of depressor type are moderately active even at normal levels of blood pressure, at least during the systolic rise, and continually exert some measure of restraint upon the medullary centers. When one suddenly stands erect from a previously reclining position the drop in systolic blood pressure may reduce or terminate the stimulation of these receptors, thus removing their restraining action on the medulla. Consequently, vasoconstrictor tone may rise and the heart beat speed, not as the result of a direct stimulation but because a brake has been released. Orthostatic vasoconstriction must in part be the result of such a diminution or termination of arterial pressoreceptor stimulation.

It should be noted that although the later compensatory rise in blood pressure restores aortic pressures to normal again, the pressure in the carotid sinuses must remain below the recumbent value. In the erect position these structures stand about 30 centimeters above the heart. The pressure in them must therefore be below the brachial pressure by a hydrostatic difference of approximately 25 millimeters of mercury. Such a dif-

ference is not wholly offset by the usual 5 to 10 millimeters of mercury rise in the brachial pressure. A permanent diminution in the stimulation of sinus pressoreceptors must therefore persist so long as the erect posture is maintained.

One other interesting possibility deserves to be mentioned. Lying along the course of the smaller arteries there may be found sensory corpuscles of the type described long ago by Pacini and given his name. Pacinian corpuscles of large size, up to 2 millimeters long, may be found near the blood vessels in the mesentery of the cat. Gammon and Bronk (14) have shown that these receptors are sensitive to increases in arterial blood pressure and, more particularly, to distention of the smaller arteries or of their own arterial supply. These investigators have secured oscillographic records of the volleys of nerve impulses which pass out of each individual receptor along the sensory nerve fiber which arises in it. Discharges occur most rapidly when pressure rises or distention occurs. Since Woollard (51) has found that a single nerve fiber may supply both the smooth muscle of the arterial wall and a nearby pacinian corpuscle, it is possible that nervous activity, aroused by pressure stimulation of the receptor, may quickly produce constriction in the artery by an axone reflex. Such local reflexes should act promptly upon assumption of the vertical position to assist in orthostatic vasoconstriction.

THE RÔLE OF THE SKELETAL MUSCLES

Various investigators have recently sought to clarify the relationship between these arterial pressoreceptors and the cardiovascular adjustments observed in the standing posture. Edholm and McDowall (11) reported that such compensations were in no way impaired in their animals by complete denervation of aortic arch and carotid sinuses. More recently Conklin and Dewey (4) have made similar observations in rabbits. On the other hand, Wald, Guernsey, and Scott (49) reported a nearly complete failure in compensation after denervation of the carotid sinuses in dogs. Later Edholm (9) was unable to detect any effect in cats after sinus denervation, but observed some loss in compensation upon section of the aortic depressor nerves. He reported that in his normal animals the systolic fall in blood pressure upon tilting the body into the vertical position became progressively greater and more persistent as the tests were repeated. He suggested that other workers, failing to note this change in the compensatory responses, may have ascribed to their denervation procedures an effect which was merely fatigue.

Most recently Mayerson (29) has fully confirmed Wald and his associates with regard to the behavior of the dog. For him either vagus section or sinus denervation has some retarding influence upon the recovery of blood

pressure in the vertical position. But when both operations have been performed together the blood pressure in the upright posture falls catastrophically and often does not recover again even when the original horizontal position is restored. The animals frequently sink into gravity shock and die.

The profound influence of the arterial pressoreceptors upon the maintenance of the arterial blood pressure in the standing position can hardly be exerted merely by an intensification of orthostatic vasoconstriction. Indeed the full elimination of arterial depressor reflexes, by denervation procedures, should permit a maximal development of vasoconstrictor tone and render such animals more than usually well able to compensate for postural changes, if vasomotor adjustments were the sole basis of the recovery process. It is well known that an experimental hypertension may be induced in animals by this operation.

It should now be stressed that arteriolar vasoconstriction, however induced by the upright posture, cannot explain the restoration of a normal venous return. It is undoubtedly of crucial importance in circumventing a downward surge of arterial blood and in preventing the edema which might otherwise occur in subcardiac regions. Since it acts to reduce the blood flow it cannot facilitate the venous return. On the contrary, it must operate to diminish it. A new balance is struck in which increased head of pressure is more than compensated by a diminished bore of the arteriolar sluice gates, so that less blood enters the capillary beds than before in many of the subcardiac organs. Particularly in the skin does such overcompensation appear to be present.

The conclusion seems necessary, therefore, that the arterial pressoreceptor systems, in whose absence orthostatic hypotension is so likely to appear, must exert a major part of their influence through some other type of reflex action which directly facilitates venous return. There is a body of evidence which indicates that tonic changes in skeletal muscle are a part of the compensation process. While no direct connection between arterial pressoreceptors and skeletal muscle tone has been established, it seems to the writer that such a relationship is strongly suggested by the literature reviewed in this section.

It is important to recognize that even the most quiet standing, with movements consciously restrained to an absolute minimum, is nevertheless characterized by rhythmic changes in activity in the antigravity muscles. Hellebrandt (19) has particularly emphasized this fact. She has secured graphic records showing that the center of weight shifts incessantly by at least a centimeter or two. "Standing is in reality movement upon a stationary base. . . . Sway is inseparable from the upright stance."

It has not generally been recognized that skeletal muscle tone, in the

absence of all other movement, has a crucial relation to the venous return even in the recumbent posture. Attention has been almost exclusively fixed upon changes in vasomotor tone involving only the smooth muscles of the blood vessels. The importance of skeletal muscle tone has been stressed by Henderson (21) and his associates (22). They have developed a simple method for the measurement of "intramuscular pressure." A fluid-filled needle is sunk into a relaxed human muscle and the pressure observed on a water manometer at which the liquid is first able to flow into the muscle. In the human biceps the pressures run between 70 and 120 millimeters of water. The values are depressed after surgical operations and in bed patients. They are lowered by voluntary overventilation and increased by the inhalation of carbon dioxide. These workers concluded that the pressures observed are a measure of the force exerted sidewise in the interstitial fluid by tonically contracting skeletal muscle fibers.

In recent extension of the observations of Henderson and his school, Mayerson and Burch (31) have specifically studied the influence of postural change. They have measured foot venous and gastrocnemius intramuscular pressures in horizontal and nearly vertical (75°) positions. It has long been known that some persons faint rather soon if they attempt to stand motionless, whereas other individuals can endure indefinitely. Mayerson and Burch reported that the average horizontal intramuscular pressure in the gastrocnemius of nonfainters was just over 100 millimeters of water, whereas fainters had an average of only half as much.

When subjects are tilted into the vertical position venous pressures in the foot, of course, rise greatly. Intramuscular pressures rise considerably in all subjects. Nonfainters reach values of 200 to 320 millimeters of water, whereas fainters achieve only 80 to 120 millimeters. Syncope is definitely related to the value of the intramuscular pressure. It occurs within a few minutes if the value does not exceed 120 millimeters. In nonfainters the higher values are reached in two stages, an initial upshoot immediately after the change to the erect position, followed by a slower secondary rise which is absent in the fainters. Fainters may circumvent syncope by standing upon their toes. Intramuscular pressures are greatly increased by this maneuver and no signs of dizziness occur.

Observations of this character reinforce the Henderson muscle tonus theory to explain the mechanism of the venous return. The reflex increase in skeletal muscle tone, induced by the upright posture, must give powerful aid to the circulation. The more strongly tonic muscles massage their contained blood vessels and push the blood up toward the heart. The venous return is thus restored.

A complete account of the neuromuscular apparatus involved in postural and tonic changes is beyond the scope of this review. Its details may be

found in such monographs as those of Camis (3) and Fulton (13). It has, of course, long been recognized that antigravity tone increases in the vertical position. The nervous actions involved include cerebellar, vestibular, and neck reflexes. In animals the vestibular influence upon skeletal muscle tone is known to be minimal when the body is in the normal horizontal position, with the head in its usual relation with the trunk. Any displacement from this normal position reflexly increases the tone of antigravity muscles, which becomes maximal when the animal is supine. A change from a horizontal to vertical position, therefore, increases the tone considerably but not maximally.

In order to explain the relationship of the arterial pressoreceptor systems to the venous return the writer tentatively concludes that the aortic arch and carotid sinus may normally initiate sensory impulses which reflexly stimulate the tonic activity of the vestibular nucleus in the medulla, an influence which persists even in the erect posture. After total denervation of these structures the skeletal muscle tone is generally somewhat diminished and venous return is impaired. This deficiency does not become evident so long as the body remains horizontal. It manifests itself only in the vertical position, where it may shortly cause the catastrophic fall in blood pressure which has been previously described. Such a conception can and should be experimentally tested.

OTHER BLOOD AND CIRCULATORY CHANGES

Assumption of the erect posture shortly induces a fall in plasma volume and a rise in plasma protein concentration, colloidal osmotic pressure, and the percentage of red blood cells as determined by the hematocrit. Such changes were reported some years ago by Thompson, Thompson, and Dailey (47) and by Ni and Rehberg (39), and have been repeatedly observed. The effect has been carefully studied by Youmans, Akeroyd, and Frank (52), who have even been able to detect a difference in the protein concentration of venous blood coming from the two legs, one active, the other quiet. Hemoconcentration occurs in both upon assumption of the erect position, but is most marked in blood coming from the quiet leg. In a more recent study Maxfield, Bazett, and Chambers (34) have detected diminutions in plasma volume even in the sitting position. In standing, the decrease may be as much as 15 per cent.

It appears that in spite of orthostatic arteriolar vasoconstriction the blood pressure at the arteriolar ends of the capillaries must be increased, in some of the dependent organs at least, so that filtration of the fluid is more rapid and hemoconcentration results. This loss in blood volume and increase in viscosity remain as permanent embarrassments to the blood flow and venous return so long as the standing posture is maintained. It

is interesting to note that like changes occur for somewhat similar reasons in exercise, whose influence may be simulated by injections of adrenalin, as Kaltreider and his associates (26) have observed.

Orthostatic vasoconstriction and diminished blood flow are particularly powerful in cutaneous areas and give evidence of their presence by a decided fall in skin temperatures. In association with their studies of hemoconcentration Youmans, Akeroyd, and Frank (52) have observed falls in cutaneous temperatures of more than 2 C. during an hour of quiet standing. Similar observations have been reported by Mayerson and Toth (33), by Asmussen, Christensen, and Nielsen (2), and by Nielsen, Herrington, and Winslow (40). The latter authors, however, found that toe temperatures may rise at the same time that all other skin areas are falling. This effect may indicate a protective mechanism against local chilling in the feet. The rise in toe temperature has also been seen by Roth, Williams, and Sheard (42), who considered it to be only part of a general phenomenon. These investigators, disagreeing with other workers, criticized them for failing to control their experimental conditions. They insisted upon the importance of controlling the activity, the environmental temperature, and the humidity, which, according to them, should in all postural tests be the basal state, 20 to 30 C. and 40 per cent, respectively. In spite of their objection the weight of evidence appears to prove that the erect posture produces a fall in skin temperature in most regions of the body.

Although cutaneous areas generally show a fall in temperature, oral and rectal temperatures rise, often by 1 C. or more, even in quiet standing, as Nielsen, Herrington, and Winslow (40) and Asmussen, Christensen, and Nielsen (2) have reported. This heating of the internal organs arises in small part from an increase in metabolism, but it is mainly caused by the cutaneous vasoconstriction which leads to a diminished rate of heat loss from the skin. An obvious clinical advantage of the recumbent position is the lower internal temperatures characteristic of that posture.

ORTHOSTATIC RESPIRATORY AND METABOLIC ADJUSTMENTS

An important factor in the restoration of the venous return is an increase in the rate and depth of the respiratory movements in the erect position. Without doubt this acceleration is reflexly induced, but the exact mechanism is not entirely clear. Mayerson (29) inclines to the view that the erect position causes a certain degree of hypoxia which stimulates the chemoreceptors of carotid and aortic bodies (43). The writer is not able to accept this view since there is no reason to believe that the arterial blood suffers any change in its chemical composition, as a result of postural change, which could lead to an oxygen lack in the chemoreceptors. Indeed, the hemoconcentration which has been previously described must appreciably increase

the oxygen capacity of each unit of the blood, and the accelerated respiration must be adequate to raise its oxygen content as it leaves the lungs.

The favorable influence upon the venous return cannot be doubted. Rate increases of as much as 20 per cent are common. In most people the tidal air increases and may be doubled. Intrathoracic pressures descend to lower levels with each deeper inspiration. The aspiratory action of the rhythmically moving thorax is thus increased and venous return aided.

A striking feature of the respiratory adjustment is a marked fall in alveolar carbon dioxide tension immediately after the assumption of the upright position. The value usually declines about 10 per cent. This phenomenon was reported long ago by Liljestrand and Wallin (27) and has been repeatedly observed. Recently Main (28) has concluded that "the diminished alveolar CO_2 upon standing is . . . due to pulmonary over-ventilation with resulting alkalemia." Hitchcock and Ferguson (24), however, opposed this view. Although they always observed the drop in alveolar carbon dioxide they found that it occurred even in those few subjects whose ventilation declined upon standing erect.

In six subjects these workers measured the three components of the vital capacity as influenced by the change from a recumbent to an upright position. Tidal air rose in four, on the average from 565 to 702 cc. It remained constant in one at 767 cc. It fell from 788 to 384 cc. in the sixth subject, obviously a great departure from the typical behavior. It would appear that abnormally high recumbent tidal airs tend to fall after the postural change. Yet in all six subjects complementary air declined sharply, on the average from 2950 to 2479 cc., while supplemental air rose by a like amount from 969 to 1488 cc. The vital capacity increased relatively little, from 4443 to 4640 cc. These authors considered that such changes must be the result of the influence of gravity in lowering the resting level of the diaphragm. This shift acted to increase the volume of the functional residual air (true residual plus supplemental). They concluded that the diminished alveolar carbon dioxide of the upright posture was initially a simple dilution phenomenon.

The maintenance of the effect must depend upon other factors. Hitchcock and Ferguson (24) expressed the opinion that its continuation was caused by the impairment of blood flow and carbon dioxide transport from the dependent parts, combined with an increased circulation rate in the arms and thorax. In support of this view they submitted data showing that the erect posture increased the carbon dioxide content of venous blood coming from the foot, with a simultaneous fall in its oxygen content, both effects indicating a more sluggish flow. In hand blood the changes are just reversed, suggesting a faster circulation. Mayerson, Sweeney, and Toth (32) have also demonstrated a retardation in blood flow in the lower extremities,

with some suggestion of an increased rate in the arms. The acceleration of blood flow in supercardiac regions is probably an important aid in the maintenance of the return in the upright position.

A number of investigators have measured the metabolic rate in quiet standing. The increase over the basal metabolic rate is surprisingly small. Asmussen, Christensen, and Nielsen (2) found no significant differences when their subjects were passively tilted from a sixty degree head-up to a sixty degree head-down position. Hitchcock and Ferguson (24) reported that in four of their six subjects there was actually a lower oxygen consumption during a ten minute period of standing than in the preceding reclining period. They therefore searched for evidence that an oxygen debt accumulated in such cases. By measuring the oxygen consumption in a second reclining period they were able to observe a burst in oxygen intake, with an average increase in rate exceeding 100 per cent of the prior reclining level. This burst occurred in the first minute after reassumption of the reclining position and the debt was fully paid in about three minutes. McMichael (38) had previously observed the same phenomenon. For both observers carbon dioxide production after reclining also increased but the respiratory quotient fell. The quotient was somewhat depressed in the standing position itself.

A more extensive study of "posture and its cost" has been made by Hellebrandt, Brogdon, and Tepper (20). These authors concluded that even under basal conditions total metabolism does not proceed steadily. Minor fluctuations without obvious cause were always observed. They did not detect the oxygen debt incurred in the erect posture. Their subjects were passively tilted to various angles with the horizontal. A rise in metabolism was always observed when the angle became greater than 45 degrees. A similar rise was observed when subjects were vertically suspended in water at body temperature in a relaxed and motionless condition. In both series metabolism increased, the average rise in a vertical position being about 6 per cent. The authors properly concluded that the metabolic cost of the erect position is small.

ORTHOSTATIC OLIGURIA

An influence of posture on the rate of urine flow was first described by Edel (8) who observed that the change from the recumbent to the standing position markedly decreased the output of urine. It has been frequently reported but is still little recognized by physiologists and clinicians, and many studies of kidney function have undoubtedly been confused by failure to control the postural factor.

Smith (45) has recently measured the diodrast and inulin clearances in man when the body is rotated on a tilt-table. It should be emphasized that the

standard values previously established by Smith and his coworkers have all been obtained in the recumbent position. He has now found that, when the body is changed to the near-vertical (80°) position, both the renal plasma flow and the glomerular filtration rate are considerably diminished. When the body is returned to the recumbent position both quantities rise to the original levels in about fifteen minutes. Mayerson (30) similarly reports a fall in blood flow in the renal artery of dogs when held vertically. It has been widely assumed that such effects are merely the result, in the kidney, of a vasoconstriction in that organ which accompanies the more general orthostatic vasomotor change.

Orthostatic oliguria is a striking phenomenon. Upon the assumption of the quiet standing position the urine flow may decline to as little as one-tenth of the preceding recumbent value. In other words, the drop in urine delivered to the bladder may far exceed any diminution in glomerular filtration rate which has been reported. This drop occurs even when a water diuresis is in progress, as Asmussen, Christensen, and Nielsen (2) have recently reported. In the writer a diuresis induced by drinking 100 cc. of water every fifteen minutes shortly caused a urine flow of nearly 150 cc. in each fifteen minute period so long as the body remained recumbent. Upon rising and standing quietly the rate dropped to only 10 cc. in the second succeeding fifteen minute period, even though water ingestion at the same rate continued. Upon reclining once more it required three-quarters of an hour for the original diuretic level to be reestablished.

Dr. Joseph Holmes of Columbia University has recently collaborated with the writer in a study, not yet published, of the effects of posture and exercise upon the urine flow in two cases of diabetes insipidus. Even the polyuria of this disease is greatly influenced by posture, an effect which appears not to have been reported previously. In one of the subjects studied the following results were obtained in one test. The average urine flow per hour was 660 cc. while lying recumbent for two and a half hours, with hydration at the rate of 800 cc. per hour. The rate fell to 220 cc. per hour in the third half-hour period of quiet standing. Upon reassumption of the recumbent position the rate fell further to only 80 cc. per hour, then rose slowly in successive half-hour periods, but had not returned to the original level after an hour and a half of recumbency. This striking effect of posture had never been observed by the subject before this test was made. He shared the writer's astonishment that quiet standing could induce so great a diminution in so powerful a diuresis.

The magnitude and time relations of such antidiuretic effects suggest that orthostatic vasoconstriction in afferent or efferent renal vessels is insufficient to account for the whole of the phenomenon. The conclusion may be made that the effect is at least partly humoral in origin. The hormone re-

sponsible can hardly be pituitrin, since the effect occurred in a subject where the posterior pituitary had lost its function. A search should be made for a nonpituitary antidiuretic humoral agent whose production is stimulated by the erect posture.

There are hints in the literature that such antidiuretic agents may exist. Gilman and Goodman (15) believed that the antidiuretic substance which they found in the urine of dehydrated rats had its origin in the pituitary gland. Some recent observers have questioned its identity with pitressin (2, 50). Ham and Landis (18) report large amounts of an antidiuretic substance in the urine from patients with toxemia of pregnancy. This substance appears to differ from pitressin in several ways. Pitressin is known to increase the excretion of chloride at the same time that it facilitates tubular reabsorption of water. The humoral agent of Ham and Landis has no such chloruretic effect. Various studies, including some recent observations of the writer, show that orthostatic oliguria is characterized by diminished chloride excretion. Such an effect does not agree with a pituitary explanation.

The most recent suggestion concerning a nonpituitary hormonal factor comes from Corcoran, Browning, and Page (5). Page (41) has summarized his views on the renin-angiotensin activator-angiotensin system. In studies of a case of orthostatic hypotension these workers find that injections of angiotensin are able temporarily to maintain blood pressure and glomerular filtration rate in the upright position, although without this aid syncope quickly develops, in association with low blood pressure and greatly diminished renal blood flow and inulin clearance. After two months' treatment in a MacLean-Allen head-up bed the patient reacted more normally to postural change, with only a transient fall in blood pressure. The authors suggest that "a physiologic function of the renal vasopressor system may be sought in vascular adaptation to the erect posture and that failure of the renal pressor system may participate in some measure in the genesis of orthostatic hypotension." This conception may be briefly summarized in the following way. The upright posture induces reflex vasoconstriction of the kidney vessels which leads to mild renal ischemia. This ischemia shortly causes an increased production of renin. Renin combining with renin activator in the blood plasma forms the pressor substance, angiotensin. Angiotensin by humoral action on the smooth muscles of the blood vessels then maintains the vasoconstriction.

SOLUTION OF THE POSTURAL PROBLEM SUMMARIZED

In concluding this review the following summary may be given. The change from a recumbent to an erect position leads to an immediate fall in the systolic blood pressure, with little change in the diastolic value. This

fall is mainly caused by the downward drainage of venous blood, particularly into the legs and liver, with a consequent reduction in the venous return to the heart. On the arterial side a swiftly moving reflex action induces an orthostatic vasoconstriction in the subcardiac regions which compensates or even overcompensates for the increased hydrostatic pressure, so that the blood flow is slowed.

The vasoconstriction, while circumventing a downward surge of arterial blood, cannot prevent some rise in capillary pressure. The filtration of fluid is therefore increased, reabsorption diminished, and plasma volume falls. Hemoconcentration increases the oxygen capacity and hematocrit in each unit of reduced blood volume.

The reflexes involved in orthostatic vasoconstriction include the following actions:

1. The fall of pressure in the great veins and right auricle stimulates pressoreceptors in the wall of that chamber. These receptors send sensory nerve impulses to the vasoconstrictor centers in the medulla and increase their tonic activity (McDowall reflex).

2. Arterial pressoreceptors in the walls of the carotid sinus and aortic arch normally exert a restraining (inhibitory) influence upon the activity of the vasoconstrictor center. They also stimulate the activity of the cardio-inhibitor center and diminish the activity of the respiratory center. As the blood pressure falls in the erect position their reflex influence is diminished or removed. The vasomotor tone increases, the heart speeds, and respiration becomes faster and deeper. Even when full compensation in brachial blood pressure has occurred the pressure in the carotid sinuses remains low, since they stand 30 centimeters above the heart and must have a pressure lower than the brachial by a hydrostatic factor of about 25 millimeters of mercury.

3. Pacinian corpuscles lying along the course of the smaller arteries are stimulated by a rise in blood pressure or distention of the vessels. Since they receive branches of the same nerve fibers which innervate the smooth muscle of the arterial wall, they may induce vasoconstriction by local axone reflex action at the time of the postural change.

Orthostatic vasoconstriction operates with particular intensity in cutaneous areas, so that skin temperatures fall in the upright position. Internal temperatures simultaneously rise, since heat loss from the skin is diminished by the vasoconstriction.

The recovery of systolic blood pressure occurs in about thirty seconds. It depends more upon restoration of the venous return than upon arteriolar vasoconstriction. The venous return is restored or nearly restored by the following actions:

1. The continual tonic contractions of skeletal muscles greatly assist in

the venous return of blood by massaging the vessels within them. This action occurs even in the recumbent, relaxed posture but is greatly increased upon the assumption of the upright position, since tone rises, particularly in antigravity muscles. Intramuscular pressure, the physical sign of increased tone, rises considerably, but more in nonfainters than in fainters. The syncope observed in some people after quiet standing is definitely related to a state of low tone and intramuscular pressure in their skeletal muscles.

Since experimental work shows that, at least in the dog, denervation of the carotid sinus and aortic arch results in orthostatic hypotension, it is tentatively suggested that sensory impulses from the pressoreceptors in these structures normally increase the skeletal muscle tone by stimulating the vestibular nucleus.

2. An increase in the rate and depth of respiration, reflexly induced, operates to aid the venous return by rendering more powerful the aspiratory action of the thorax.

3. Although the rate of blood flow in subcardiac regions is diminished the flow may be accelerated in the arms, upper thorax, and head.

Kidney function is greatly influenced by posture. The glomerular filtration rate and renal blood flow are considerably reduced during quiet standing. The urine flow is even more drastically reduced. Orthostatic oliguria is observed even when a water diuresis is in progress. The flow may fall to as little as one-tenth of the previous recumbent value and is not fully restored for some time, forty-five to ninety minutes, in a second reclining period. The magnitude and time relations of this effect suggest that although it must depend in part upon reduced glomerular filtration, it requires some additional factor to develop its full intensity. It is suggested that some humoral mechanism stimulated by the erect posture is concerned. Since a marked orthostatic oliguria has been observed in a case of diabetes insipidus the hormone involved is presumably not pituitrin. A possibility exists that the renin-angiotensin activator-angiotensin mechanism, excited by the vasoconstriction and renal ischemia of the upright posture, may intervene to maintain the vasoconstriction.

BIBLIOGRAPHY

- (1) ARNOLD, O.: Über Blutdrucksteigernde und Diuresehemmende Substanzen im Harn. *Arch. f. exper. Path. u. Pharmacol.*, **190**: 360, 1938.
- (2) ASMUSSEN, E., CHRISTENSEN, E. H., AND NIELSEN, M.: The Regulation of Circulation in Different Postures. *Surgery*, **8**: 604, 1940.
- (3) CAMIS, M.: *Physiology of the Vestibular Apparatus*. Clarendon Press, Oxford, 1930.
- (4) CONKLIN, R. E. AND DEWEY, V. C.: The Effect of Postural Changes on Blood Pressure in the Rabbit. *Am. Jour. Physiol.*, **133**: 244, 1941.

- (5) CORCORAN, A. C., BROWNING, J. S., and PAGE, I. H.: Renal Hemodynamics in Orthostatic Hypotension. Effects of Angiotonin and Head-up Bed. *Jour. Am. Med. Ass.*, **119**: 793, 1942.
- (6) DE WAELE, H. AND VAN DE VELDE, J.: L'Artère Hépatique Zone Réflexogène. *Arch. internat. de Physiol.*, **36**: 371, 1933. La Vaso-Sensibilité des Vaisseaux Sanguins Périphériques. *Arch. internat. de Physiol.*, **36**: 391, 1933.
- (7) DE WAELE, H. AND VAN DE VELDE, J.: Sur un Réflexe Hypertenseur des Oreillettes. *Arch. internat. de Physiol.*, **50**: 33, 1940.
- (8) EDEL, P.: "Cyklische" Albuminurie und Neue Gesichtspunkte für die Bekämpfung von Albuminurien. *München med. Wchnschr.*, **4**: 1833, 1901.
- (9) EDHOLM, O. G.: Effect of Gravity on the Blood Pressure of the Cat. *Jour. Physiol.*, **98**: 79, 1940.
- (10) EDHOLM, O. G.: The Compensatory Mechanism of the Splanchnic Circulation during Changes of Posture. *Jour. Physiol.*, **101**: 1, 1942.
- (11) EDHOLM, O. G. AND McDOWALL, R. J. S.: The Effect of the Aortic and Cardiac Depressors on the Circulatory Response to Posture. *Jour. Physiol.*, **86**: 8, 1936.
- (12) ELLIS, L. B. AND HAYNES, F. W.: Postural Hypotension with Particular Reference to Its Occurrence in Disease of the Central Nervous System. *Arch. Int. Med.*, **58**: 773, 1936.
- (13) FULTON, J. F.: *Physiology of the Nervous System*. Oxford University Press, New York City, 1938.
- (14) GAMMON, G. D. AND BRONK, D. W.: The Discharge of Impulses from Pacinian Corpuscles in the Mesentery and Its Relation to Vascular Changes. *Am. Jour. Physiol.*, **114**: 77, 1935-36.
- (15) GILMAN, A. AND GOODMAN, L.: Secretory Response of Posterior Pituitary to Need for Water Conservation. *Jour. Physiol.*, **90**: 113, 1937.
- (16) GOLDBLOOM, A. A., KRAMER, M. L., AND LIEBERSON, A.: Clinical Changes in Circulatory Adjustments. VI. Physiologic Relation between Posture and Cardiac Output. *Arch. Int. Med.*, **65**: 178, 1940.
- (17) GROLLMAN, A.: *The Cardiac Output of Man in Health and Disease*. C. C. Thomas, Baltimore, 1932.
- (18) HAM, G. C. AND LANDIS, E. M.: A Comparison of Pituiratin with the Antidiuretic Substance Found in Human Urine and Placenta. *Jour. Clin. Investigation*, **21**: 455, 1942.
- (19) HELLEBRANDT, F. A.: Standing as a Geotropic Reflex. The Mechanism of the Asynchronous Rotation of Motor Units. *Am. Jour. Physiol.*, **121**: 471, 1938.
- (20) HELLEBRANDT, F. A., BROGDEN, E., AND TEPPER, R. H.: Posture and Its Cost. *Am. Jour. Physiol.*, **129**: 773, 1940.
- (21) HENDERSON, Y.: *Adventures in Respiration*. Williams & Wilkins Company, Baltimore, 1938.
- (22) HENDERSON, Y., OUGHTERSON, A. W., GREENBERG, L. A., AND SEARLE, C. P.: Muscle Tonus, Intramuscular Pressure, and the Venopressor Mechanism. *Am. Jour. Physiol.*, **114**: 261, 1935-6. Air Movement as a Stimulus to the Skin, the Reflex Effects upon Muscle Tonus, and Indirectly Upon the Circulation of the Blood; Also the Effects of Therapeutic Baths. *Am. Jour. Physiol.*, **114**: 269, 1935-6.
- (23) HILL, L.: The Influence of the Force of Gravity on the Circulation of the Blood. *Jour. Physiol.*, **18**: 15, 1895.
- (24) HITCHCOCK, F. A. AND FERGUSON, J. K. W.: Respiratory and Circulatory Adjustments to the Erect Posture. *Am. Jour. Physiol.*, **124**: 457, 1938.

- (25) JEFFERS, W. A., MONTGOMERY, H., AND BURTON, A. C.: Types of Orthostatic Hypotension and their Treatment. *Amer. Jour. Med. Sci.*: **202**: 1, 1941.
- (26) KALTREIDER, N. L., MENEELY, G. R., AND ALLEN, J. P.: The Effect of Epinephrine on the Volume of the Blood. *Jour. Clin. Investigation*: **21**: 339, 1942.
- (27) LILJESTRAND, G. AND WOLLIN, G.: Einfluss der Körperstellung auf die Zusammensetzung der Alveolarluft des Menschen. *Zentralbl. f. Physiol.*, **27**: 1268, 1913.
- (28) MAIN, R. J.: Alterations of Alveolar CO₂ in Man Accompanying Postural Change. *Am. Jour. Physiol.*, **118**: 435, 1937.
- (29) MAYERSON, H. S.: Effect of Gravity on the Blood Pressure of the Dog. *Am. Jour. Physiol.*, **135**: 411, 1942.
- (30) MAYERSON, H. S.: Influence of Posture on Blood Flow in Dog. *Am. Jour. Physiol.*, **136**: 381, 1942.
- (31) MAYERSON, H. S. AND BURCH, G. E.: Relationships of Tissue (Subcutaneous and Intra-Muscular) and Venous Pressures to Syncope Induced in Man by Gravity. *Am. Jour. Physiol.*, **128**: 258, 1940.
- (32) MAYERSON, H. S., SWEENEY, H. M., AND TOTH, L. A.: The Influence of Posture on Circulation Time. *Am. Jour. Physiol.*, **125**: 481, 1939.
- (33) MAYERSON, H. S. AND TOTH, L. A.: The Influence of Posture on Skin and Subcutaneous Temperatures. *Am. Jour. Physiol.*, **125**: 474, 1939.
- (34) MAXFIELD, M. E., BAZETT, H. C., AND CHAMBERS, C. C.: Seasonal and Postural Changes in Blood Volume Determined by a Carbon Monoxide Method, Employing a Differential Electric Photometer for the Estimation of Low Percentage Saturation of Hemoglobin with Carbon Monoxide. *Am. Jour. Physiol.*, **133**: 128, 1941.
- (35) McDOWALL, R. J. S.: A Vago-Pressor Reflex. *Jour. Physiol.*, **59**: 41, 1924-25.
- (36) McDOWALL, R. J. S.: The Nervous Control of the Blood Vessels. *Physiol. Rev.*, **15**: 98, 1935.
- (37) McDOWALL, R. J. S.: The Control of the Circulation of the Blood. Longmans, London, 1938.
- (38) McMICHAEL, J.: Postural Changes in Cardiac Output and Respiration in Man. *Quart. Jour. Exp. Physiol.*, **27**: 55, 1938.
- (39) NI, TSANG-G. AND REHBERG, P. B.: On the Influence of Posture on Kidney Function. *Jour. Physiol.*, **71**: 331, 1931.
- (40) NIELSEN, M., HERRINGTON, L. P., AND WINSLOW, C. E. A.: The Effect of Posture upon Peripheral Circulation. *Am. Jour. Physiol.*, **127**: 573, 1939.
- (41) PAGE, I. H.: Nature of Clinical and Experimental Arterial Hypertension. Edward Gamaliel Janeway Lect. *Jour. Mt. Sinai Hosp.*, **8**: 3, 1941.
- (42) ROTH, G. M., WILLIAMS, M. M. D., AND SHEARD, C.: Changes in the Skin Temperatures of the Extremities Produced by Changes in Posture. *Am. Jour. Physiol.*, **124**: 161, 1938.
- (43) SCHMIDT, C. F. AND COMROE, J. H.: Functions of the Carotid and Aortic Bodies. *Physiol. Rev.*, **20**: 115, 1940.
- (44) SCHNEIDER, E. C. AND CRAMPTON, C. B.: The Effect of Posture on the Minute Volume of the Heart. *Am. Jour. Physiol.*, **110**: 14, 1934.
- (45) SMITH, H. W.: The Physiology of the Renal Circulation. *Harvey Lectures*, **35**: 166, 1939-40.
- (46) STARR, I. AND RAWSON, A. J.: Vertical Ballistocardiograph; Experiments on Changes in Circulation on Arising, with Further Study of Ballistic Theory. *Am. Jour. Physiol.*, **134**: 403, 1941.

- (47) THOMPSON, W. O., THOMPSON, P. K., AND DAILEY, M. E.: The Effect of Posture upon the Composition and Volume of the Blood in Man. *Proc. Nat. Acad. Sci.*, **14**: 94, 1928.
- (48) TOWER, S. H.: Pyramidal Lesion in the Monkey. *Brain*, **63**: 36, 1940.
- (49) WALD, H., GUERNSEY, M., AND SCOTT, F. H.: Some Effects of Alteration of Posture on Arterial Blood Pressure. *Am. Heart Jour.*, **14**: 319, 1937.
- (50) WALKER, A. M.: Experiments upon the Relation between the Pituitary Gland and Water Diuresis. *Am. Jour. Physiol.*, **127**: 519, 1939.
- (51) WOOLLARD, H. H.: Innervation of Blood Vessels. *Heart*, **13**: 319, 1926.
- (52) YOUMANS, J. B., AKEROYD, J. H., AND FRANK, H.: Changes in the Blood and Circulation with Changes in Posture. The Effect of Exercise and Vasodilatation. *Jour. Clin. Investigation*, **14**: 739, 1935.

EMBRYONAL CARCINOMA OF THE TESTICLE*†

REPORT OF A CASE IN AN INFANT AND A REVIEW OF THE RECENT LITERATURE FROM A CLINICAL-PATHOLOGIC VIEWPOINT

HENRY A. BRIELE, M.D.

BALTIMORE, MD.

HISTORICAL

The study of testicular tumors has taken place in comparatively recent times. St. Donat identified a rudimentary skull and pigmented optic cups in a testicular tumor in 1696 and thus established the fetal character of some of these growths. Similar discoveries were made by Prochaska in 1803 and by André de Perrone in 1833, but it was not until the middle of the nineteenth century that Curling divided the growths into benign cystic and malignant solid types. He also determined with the aid of the microscope that cancer regularly begins in the rete testis. Johnson in 1856 was the first to recognize the tridermal constitution of testicular tumors. Langhans, while working with Kocher in 1887 made an important contribution when, with the aid of microscopic sections, he classified the tumors on histologic structure. He also suspected that a large proportion of all testicular tumors were of teratoid origin. This suspicion later was proved by Wilms in 1896 when he showed that all complex tumors were tridermal. In 1906 Chevassu (5) concluded that certain monocellular malignant tumors of the testes arose from mature cells of the seminiferous tubules. Although he was unable to demonstrate the transition between the normal and tumor cells he called these tumors seminomas. Ever since his paper was published there has been considerable disagreement over the pathologic classification of testicular tumors. In 1911 Ewing came to the conclusion "that all the common and nearly all of the rarer tumors of the organ arise from totipotent sex cells, and that the monodermal forms of these growths represent one-sided developments of tridermal teratomas." During the last thirty or forty years there has been considerable controversy over this one fundamental point and much work has been done in order to prove or disprove it. Today such able investigators as Pick, Ribbert, O'Crowley and Martland, Hinman, Gibson and Kutzmann, and Johnson and Carr agree with Ewing (9) that the monocellular testicular neoplasm is of teratomatous nature. Others who can speak as authoritatively, including Frank, Bell, Schultz and Eisendrath, are just as certain that Chevassu was right in saying

*From the Department of Pathology, School of Medicine, University of Maryland, and the Department of Surgery, University Hospital.

†Received for publication November 24, 1942.

that these tumors arise from adult sex cells. Although neither group has yet settled the matter satisfactorily, it can be said that Ewing's classification as well as his conception of these tumors are generally accepted in the United States.

INCIDENCE AND ETIOLOGY

Dew (8) during a review of the literature found that malignant testicular tumors have been reported in infants under one year of age and in men as old as eighty years. Barringer and Earl (1) surveyed thirty-seven autopsied cases of these growths and reported an age incidence from a stillborn to a subject forty-seven years old.

Tanner (20) wrote that malignant testicular tumors constituted 0.05 to 0.06 per cent of all male admissions. Herman (13) found that they comprised 0.6 per cent of all malignant tumors in men, and also that 75 per cent of the testicular neoplasms were seen in men between the ages of twenty-five and forty-five years.

In 1939 Dean (7) reported that at Memorial Hospital these tumors comprised 3.4 per cent of all tumors of the genito-urinary system, 2 per cent of all the malignant tumors in males, and 1 per cent of all malignant tumors when both sexes were considered.

For years trauma was thought to play a prominent part in the formation of these tumors. Recently, however, practically all investigators agree with Ewing (10) that single trauma alone does not initiate a malignant growth but rather serves to bring a previously existent tumor to the attention of the patient. The influence of cryptorchidism has aroused a great deal of discussion. McNally (18) found an incidence of over 12 per cent of malignancies in 649 cases of undescended testicles, and Rea reviewed 1371 similar cases and discovered malignant tumors in 9.9 per cent. This reported incidence of better than 10 per cent in undescended testicles is a striking contrast to the 0.05 to 2 per cent incidence in the general male population.

Finally, Gilbert (12) collected 841 cases of malignancy in undescended testicles and found that in sixty-three of them malignancy had developed after the surgical fixation of the testicle in the scrotum.

SYMPTOMS AND SIGNS

The presenting symptom in the great majority of cases is a painless enlargement of the testicle. Dean (6) reported in 1929 that 92 per cent of his 124 cases showed this painless swelling as the first symptom. Testicular pain is rarely complained of unless internal hemorrhage has occurred, with a subsequent rapid enlargement of the involved testicle. However, patients are usually aware of a continuous pull and a sensation of weight as the tumor enlarges.

Other complaints include low back pain, pain in the chest, lower abdomen or kidney regions. These manifestations of pain in distant regions are almost invariably indicative of metastases. However, there have been reported rare cases where the patient first visited his physician because of unaccountable weight loss, only to find that one testicle contained a small malignant tumor. This sequence of events is encountered more often in the case of the abdominal or inguinal testicle than when it is present in its usual habitat.

The objective signs vary with the extent of the lesion. The testicular mass usually manifests itself as a solid tumor that retains the shape of the testicle, since it does not pass the confines of the tunica albuginea until late in the disease. The picture varies from the case in which the early tumor is found as a small firm nodule in the testicle to instances where the tumor is so large that it causes the scrotum to be smooth and glistening.

DIAGNOSIS

It is important to cultivate the habit of inspecting the scrotum in a standing position as well as carefully palpating its contents during all routine physical examinations. The latter procedure should be done in such a way as to completely outline the testicle, epididymis, and cord.

The tumor-bearing testicle is abnormally heavy and early in the disease it is firm and solid without a stony hardness, the surface is smooth and regular, and the epididymis may be differentiated. Later in the disease palpable irregularities and nodules are found on the surface of the tumor, and at times softening and fluctuation appear over areas of necrosis; in addition, the epididymis is usually lost in the enlargement. The tumor is rarely sensitive to pressure. The scrotum is usually freely movable over the tumor but may become indurated, reddened, and glazed from stretching. Dilated superficial veins are often present. Extension into the scrotum and cord are late manifestations of the condition.

Since malignant testicular tumors are usually solid they will not transilluminate, but many cases have been reported where a hydrocele has been associated with such a tumor.

In the past, aspiration of the above-mentioned fluctuant areas and even punch biopsies have been resorted to as diagnostic aids. Fortunately, today there are few clinicians unaware of the dangers associated with these manipulations and such authorities as Barringer, Hinman, Dean, Wesson and many others strongly condemn these procedures. In the rare case of a tense hydrocele that prevents proper palpation of the testicle, careful aspiration of the hydrocele fluid may be done with impunity. In these cases, too, the general opinion is that it is safer to open the hydrocele sac through an inguinal incision after the vessels of the cord have been occluded but not crushed by a clamp.

The examination of a suspected testicular tumor should include deep abdominal palpation in search of retroperitoneal metastases, particularly in the lumbar and epigastric regions, as well as a supraclavicular lymph node. Both anteroposterior and lateral teleoroentgenograms should be taken to rule out thoracic metastases. In cases of suspected abdominal metastases urograms may prove helpful.

Zondek in 1929 was the first to observe the appearance of prolactin A in the urine of a man suffering from a malignant testicular tumor. In 1933 Ferguson (11) in a painstakingly prepared report concluded that the histologic type of testicular malignancies could be determined by qualitative tests for gonadotropic hormone excreted in the patient's urine. This finding was welcomed by most clinicians as a means to end many of the difficulties encountered in diagnosis, treatment and prognosis. During the following six to eight years this work was verified by many able investigators. However, in 1941 Hinman (15) reported that in his experience not more than 25 per cent of these malignant tumors produced a positive Aschheim-Zondek test. Furthermore, he found the test to be of little help in diagnosis but, if positive, it was of value in judging the prognosis and in supervising post-operative roentgen therapy. Again in January, 1942 Dean, Gilbert and others expressed the opinion that there is little correlation between the amount of gonadotropic hormone and the histologic type. Twombly (21) in discussing Dean's article said that he could mention at least a dozen cases in his experience in which testicular tumors had produced no hormone. In his opinion a positive test is of diagnostic value whereas a negative test means little.

DIFFERENTIAL DIAGNOSIS

When attacking this problem twenty-five years ago most practitioners made the diagnosis of testicular neoplasm only after all other causes of scrotal enlargement had been excluded. Today, however, a great many authorities agree that one should consider all testicular swellings as malignant tumors until proved otherwise. The following discussion includes the most common conditions from which testicular tumors must be differentiated.

Hydrocele. When tense and thick-walled these cystic swellings are at times troublesome. However, the shape of the swelling rarely leads one to believe that it is limited by the tunica albuginea. Furthermore, if the lack of transillumination results from thickened or calcareous walls, a history of long standing is usually available. The most important point to remember in this relation is that a tumor of the testicle is at times masked by the presence of a hydrocele.

Gonorrheal and non specific epididymo-orchitis. These infections are accompanied by the signs and symptoms of infection, and in the early stages

the mass is usually associated with severe pain as well as tenderness and fever. Here again, however, there are reported cases of gonococcal urethritis associated with testicular tumors (8).

Tuberculous epididymitis. This condition is becoming less common every year. Furthermore, moderate pain and tenderness are usually present and bacilli may be isolated from the urine. If the testicle alone is involved this condition may present a real problem, but ordinarily the vas deferens as well as the prostate and seminal vesicles are nodular.

Hematocoele of the tunica vaginalis. In an industrial age any condition that is related to trauma becomes important. These hematomata are often smooth, hard, solid, and painless; they will not transilluminate and are not fluctuant. An item of differential importance is that the onset is associated with acute pain, rapid swelling, and scrotal ecchymoses. The swelling often diminishes in size and remains stationary for months. However, in spite of an accurate history the most sensible way to make a diagnosis in the doubtful cases is by immediate operation.

Syphilis—gumma. Since both gumma and malignant tumors involve the testicle primarily and are ordinarily painless, this condition has been of foremost differential importance. The serologic tests are usually positive in cases with gumma. Furthermore, the therapeutic test with iodides and bismuth will, according to Hinman (14), usually cause resolution of a gumma within a week.

The less common conditions to be considered include benign tumors, torsion of the cord, spermatocele, and contusion of the testicle. However, these rarely present any great difficulty in diagnosis.

It should be mentioned that Hinman and his associates advocate orchidectomy for diagnosis. They take the stand that the loss of a testicle which is tuberculous, luetic, or the site of epididymo-orchitis is negligible, should it prove to be one of these rather than a malignant tumor.

PATHOLOGY

In the histologic study of malignant tumors of the testicle it is possible, on the basis of the type and arrangement of the component cells, to recognize certain rather specific varieties. It must be borne in mind, however, that mixed types and variants are encountered.

The tumors in the twenty-three cases studied in the Department of Pathology of the University of Maryland fell into the following classification, which is a modification of that offered by Ewing (9).

1. Malignant teratoma (Fig. 1). Strictly speaking, all malignant testicular tumors may be placed under this main heading because, according to Ewing, all the monodermal forms of these growths represent a one-sided development of tridermal teratomas. Three of the author's cases neces-

sarily fell into this group since they presented adult forms of all three germ layers and in addition showed a malignant change of one type of epithelial tissue.

2. Embryonal carcinoma (Fig. 2). These tumors for the most part consist of large, pale, round or polyhedral cells of uniform size lying in sheets or diffusely placed in a fibrous stroma which is infiltrated sparsely with lymphocytes. Five of these cases fell into this group.

3. Embryonal carcinoma with lymphoid stroma (Fig. 3). Statistics show this to be the most common testicular tumor. It differs from those in Fig. 2 in that its stroma consists of numerous lymphocytes lying in a sparse bed of immature fibroblasts. Eight of the author's cases showed this type of malignancy.

Types 2 and 3 are made up of well differentiated cells that somewhat resemble adult seminal epithelium. It was this picture that led Chevassu and others to call such tumors seminomas.

4. Embryonal adenocarcinoma (Figs. 4, 5, and 6). This is the second most common type. Histologically this tumor presents irregular alveoli lined by rows of large cuboidal cells with large hyperchromatic nuclei (Fig. 4). Most of these tumors are well differentiated but, according to Hinman (15), one occasionally encounters a primitive adenocarcinoma associated with a high hormonal excretion that is extremely malignant. Four of the tumors reported have been placed in this group, including that of the case report which is represented by Figs. 5 and 6.

5. Small anaplastic type. Ewing (9) mentions this type in which the cells are smaller and more undifferentiated, the structure of which at times resembles a lymphosarcoma. No other author was found who included this type in his discussion but three of the tumors in the present series were placed in this classification.

6. Chorio-epithelioma. None of the cases reported here fell into this group but its pathologic characteristics are mentioned because of the extreme degree of malignancy. These tumors are usually small but they metastasize early and widely. The metastases may extend into the veins in forms resembling hydatid moles. Histologically they consist of various arrangements of syncytial cells associated with glycogen-bearing Langhans' cells.

Testicular tumors rarely metastasize to the inguinal nodes unless they have perforated the tunica vaginalis and involved the scrotum, which, as previously noted, is a late manifestation.

The lumbar lymphatic glands are usually the first involved. The secondary growths probably follow upward, involve the preaortic and other retroperitoneal nodes, and finally the thoracic lymphatics. Wesson (22) and others have reported cases where the metastases extended to the con-



FIG. 1. Malignant teratoma. No. 42082a

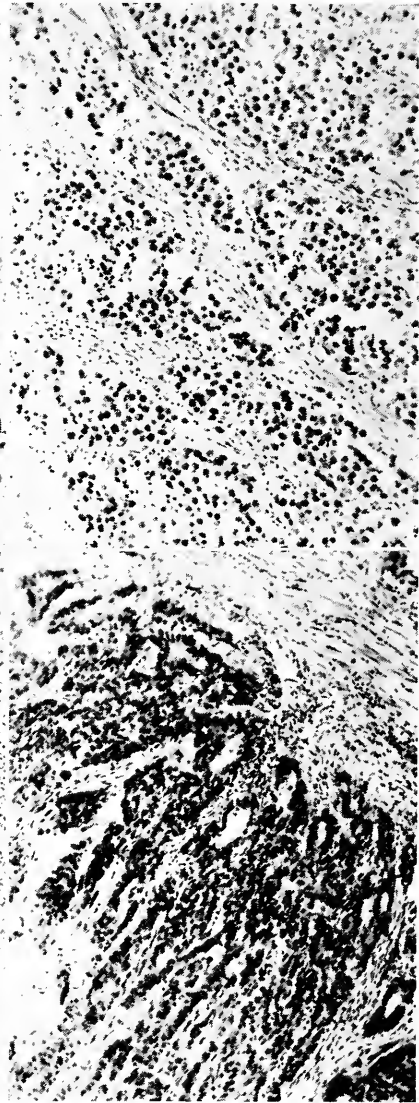


FIG. 2. Embryonal carcinoma. No. 36495a

FIG. 3. Embryonal carcinoma with lymphoid stroma. No. 41841c

FIG. 4. Embryonal adenocarcinoma. No. 12464

tralateral lumbar lymph glands. This is explained by the fact that the lymph vessels anastomose across the midline at the bifurcation of the inferior vena cava and again at the level of the renal pedicles.

FIG. 5. Embryonal adenocarcinoma (Case report). No. 44331b

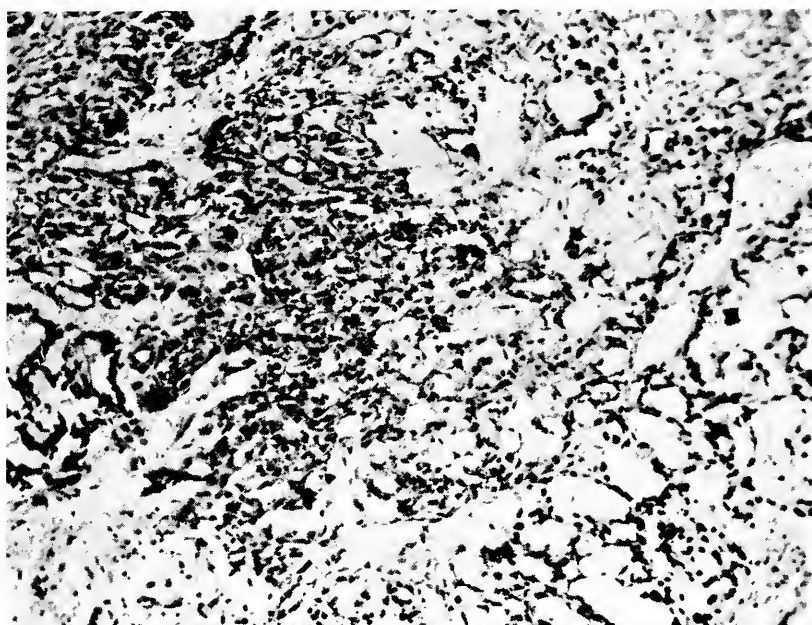


FIG. 6. Right testicle 14 month old boy (Case report). No. 44331

Barringer and Earl (1) in their survey of thirty-seven autopsied cases found the lungs involved in 78 per cent of the cases and the liver also involved in 75 per cent of these same cases. Bilateral abdominal involvement was present in 72 per cent and the genito-urinary tract was affected in 24 per cent of all cases. Their findings also lead them to the important conclusion that whenever Virchow's node is involved there is probably a metastatic chain of nodes along the course of the thoracic duct.

Vascular metastases to the lungs, liver, brain, kidneys, and stomach have also been reported, and in rare cases tumor cords have been found extending up to the vena cava to the heart. This is seen most frequently in cases of chorio-epithelioma.

TREATMENT

The treatment of malignant tumors of the testicle has changed greatly during the past forty years. Prior to 1906 the only therapeutic method practiced was the "operation of defeat," that is, simple amputation or orchidectomy. Three year cures (?) by this method varied, according to Kober (17) and Chevassu (5), from 8 to 19 per cent, and Tanner (20) found only 5.5 per cent of 465 cases alive after four years. The extremely poor results of this simple treatment acted as a stimulus for the development of more satisfactory and up-to-date methods of treatment.

The next step, the radical removal of the lumbar lymphatics, was developed by French surgeons and in 1906 Cuneo performed the first complete retroperitoneal excision of all node-bearing tissue from the involved side. This operation was developed further by Chevassu and other French surgeons and steadily gained favor. In 1919 Hinman (16) analyzed his own cases and a number from the literature and concluded that the radical operation was justified in suitable cases because of the universally unfavorable results following simple castration.

Preoperative radiation in the form of the radium pack was first advocated by Barringer and Dean (2) in 1921. Since then deep roentgen therapy has improved greatly because of advances in technic and the utilization of high voltage. In 1932 Randall advocated and began preoperative irradiation of testicular tumors. He stressed the fact that the distal areas should be irradiated first and the testicle irradiated only after treatment has been given the draining lymphatics. An orchidectomy should be done four to six weeks later. In 1939 he reported 91 per cent of two year cures (?) in forty-five patients. One realizes that this Utopian figure is unusually high when considering the many cases reported that have developed metastases in six or eight years after operation and radiation.

In 1939 Wesson (22) reported that since the abdominal lymphatics anastomose at several levels he has always questioned the rationality of the

operation that removed the nodes from only one side. He has depended on conservative surgery and deep roentgen therapy since 1924, and in 1939 his first two patients were alive and in perfect health after fifteen years. Chevassu wrote Wesson in 1939 that he had given up his radical operation in favor of castration with pre- and postoperative radiation. Barringer, while discussing Wesson's (22) paper, agreed that the Chevassu-Hinman operation was obsolete.

Hinman and his colleagues (15) in an article published in 1941 take a pessimistic attitude toward the whole subject. They feel radical surgery has proved impractical and have discontinued its use; also, that the promise of cure by irradiation has fallen far short of expectations. It is their belief that all testicular tumors should be treated by immediate orchidectomy and adequate postoperative roentgen therapy. The reason these investigators do not advise preoperative irradiation is that it destroys the histologic picture and often makes a pathologic diagnosis impossible. Dean and others felt that this was an academic point and that the patients' welfare should be considered first. They therefore advocated preoperative as well as postoperative roentgen therapy.

PROGNOSIS

When one considers the degree of malignancy as well as the early metastases of these tumors, it becomes obvious that a grave prognosis should be given in all cases. However, according to Hinman, the prognosis is dependent to some extent on the following three factors:

The pathologic type of the primary tumor. Patients suffering from the more differentiated embryonal carcinoma, with or without lymphoid stroma, and from the embryonal adenocarcinoma offer the best prospect of recovery. The prognosis is poor in the more anaplastic types, while chorio-epithelioma is fatal even in the absence of demonstrable metastases and regardless of therapy.

The presence or absence of clinical metastases. Demonstrable metastases present a poor prognosis regardless of their radiosensitivity. In this relation Hinman and others believe that radiocurability appears to be in an inverse proportion to radiosensitivity; and although some testicular tumors are radiosensitive, none are radiocurable.

The presence or absence of gonadotropic hormones in the urine before and after operation. Contrary to Ferguson's (11) belief, recent investigations have shown that gonadotropic hormones are not present in the urine of the majority of patients having testicular tumors. Also, that urinary hormone is more prevalent in cases of chorio-epithelioma, the most malignant type, than with any other tumor.

The patients whose urine never contains any hormone have the best

prognosis, whereas those whose urine is positive preoperatively and later becomes negative have a better prognosis than the patients who continue to secrete hormone.

The following helpful prognostic summary was put forth by Hinman (14):

1. Patients presenting no metastases and no hormone have a good prognosis.

2. Those with demonstrable metastases and no hormone have a fair to poor prognosis, depending on the reaction of the metastases to roentgen therapy.

3. Patients who continue to excrete hormone have a poor prognosis whether metastases are demonstrable or not.

CASE REPORT

The patient was a 14 month old white male infant first seen by a physician on August 14, 1942, because of a swelling in the right side of the scrotum that was originally noticed about two or three months before. When first seen the mass was slightly larger than the left testicle and then steadily increased in size. It had never been painful or caused any discomfort. A provisional diagnosis of embryonal carcinoma of the testicle was made and the patient admitted to the University Hospital on August 18, 1942, under the care of Dr. W. H. Toulson.

The family and past histories were noncontributory. A physical examination revealed a pale 14 month old white male child who was well developed and well nourished, and who was 31 inches in height and weighed 25½ pounds. The skin and mucous membranes were pale. The chest, abdomen, and extremities were negative.

The right side of the scrotum was filled with a hard, solid, bluish mass measuring 4 by 3 cm. This mass did not transilluminate light and apparently was not tender. It retained the general shape of the testicle and was freely movable in the scrotum. The epididymis could not be separated from the mass. No palpable metastases were present in the cord, abdomen, inguinal or supraclavicular region. The left testicle was fully descended and entirely normal.

Laboratory studies. August 17, 1942: Examination of the blood showed hemoglobin 56% (8 grams per 100 cc.), white blood cells 9800.

August 18, 1942: The serologic test for syphilis was negative.

A roentgenograph of the chest revealed clear lungs. The diaphragm, heart, and great vessels were normal. No definite evidence of metastatic malignancy was demonstrated.

An intravenous pyelogram and a roentgenogram of the bones of the pelvis and lumbar spine were entirely normal.

August 22, 1942: The Friedman test was positive.

October 7, 1942: The Friedman test was negative.

Hospital course: During the first week of hospitalization the patient received 500 cc. of citrated blood intravenously. On August 25, 1942 the tumor-bearing right testicle was removed under ether anesthesia by Dr. W. H. Toulson.

Pathologic findings: The testicle (Fig. 6) measured 5 by 4 by 4 cm. and was well encapsulated by the tunica albuginea. Its external surface was smooth and glistening. The mass was of a doughy consistency. The cut surface presented a yellowish homogeneous mass with several small cystic areas averaging 5 mm. in diameter. Microscopically (Fig. 5) the sections presented large polygonal cells with large pyknotic nuclei arranged as irregular, thin-walled acini lying in a loose stroma of collagen fibers. There were some

areas of necrosis sparsely infiltrated with lymphocytes, plasma cells, and occasional polymorphonuclear leukocytes.

The postoperative course was uncomplicated and the patient was discharged in good condition on August 30, 1942.

Deep roentgen therapy was begun August 28, 1942 and continued until September 22, 1942. During that time the patient received 777 r units to the upper right abdomen and 777 r units to the right anterior pelvis.

The patient was seen again on November 16, 1942, at which time he appeared in good health. His appetite was good, he was sleeping well, and showed no irritability. The skin and mucous membranes were of normal color and no metastases were palpable. The Friedman test and roentgenograph of the chest were negative at that time.

CONCLUSIONS

1. The greatest hope at present for "permanent cures" of these malignant conditions is early diagnosis.

2. The most satisfactory treatment known today is early orchidectomy preceded and followed by adequate deep roentgen therapy to all lymph node-bearing areas.

3. Until the etiology, pathology, and hormonal status of these tumors are founded on known and accepted facts, a simple clinical classification is most practical.

4. The Friedman test, if positive, is of considerable help when judging the prognosis and supervising the treatment.

5. One cannot safely use the word "cure" regarding these cases until at least eight and preferably ten years have passed following orchidectomy and deep roentgen therapy.

6. An interesting case of an embryonal adenocarcinoma of the testicle in a 14 month old male infant is presented.

BIBLIOGRAPHY

- (1) BARRINGER, B. S. AND EARL, D.: A Survey of Thirty-Seven Autopsied Cases of Teratoma Testis. *Surg., Gynec., and Obst.*, **72**: 591, 1941.
- (2) BARRINGER, B. S. AND DEAN, A. L.: Preoperative Radiation of Testicular Tumors. *Jour. Am. Med. Assn.*, **77**: 1237, 1921.
- (3) BUIGAS, R. O.: Surgical Therapy of Seminoma of Infant Ten Months Old. *Bol. Soc. Cubana de Pediat.*, **13**: 234, 1941.
- (4) CAMPBELL, M. F.: *Pediatric Urology*, p. 306. The Macmillan Co., New York City, 1937.
- (5) CHEVASSU, M.: *Tumeurs de testicle*, p. 239. Paris, 1906.
- (6) DEAN, A. L.: The Treatment of Teratoid Tumors of the Testis With Radium and Roentgen Rays. *Jour. Urol.*, **21**: 83, 1929.
- (7) DEAN, A. L.: A Discussion of Tumors of the Testicle by M. B. Wesson. *Tr. Am. Assn. Gen.-Urin. Surg.*, **32**: 389, 1939.
- (8) DEW, HAROLD R.: *Malignant Disease of the Testes*. H. K. Lewis Co., Ltd., London, 1925.
- (9) EWING, JAMES: *Neoplastic Diseases*, p. 854. W. B. Saunders Co., Philadelphia, 1940.
- (10) EWING, JAMES: Modern Attitude toward Traumatic Cancer. *Arch. Path.*, **19**: 690, 1935.

- (11) FERGUSON, R. S.: Quantitative Behavior of Prolan A in Teratoma Testis. *Am. Jour. Cancer*, **18**: 245, 1933.
- (12) GILBERT, J. B.: Studies in Malignant Testicular Tumors Developing After Orchidopexy. Two Cases and a Review of Sixty-Three. *Jour. Urol.*, **46**: 740, 1941.
- (13) HERMAN, L.: Practice of Urology, p. 672. W. B. Saunders Co., Philadelphia, 1938.
- (14) HINMAN, F. AND SMITH, D. R.: Tumors of Testes. *Jour. Med.*, **22**: 393, 1941.
- (15) HINMAN, F., JOHNSON, C. M., AND CARR, J. L.: The Clinico-Pathologic Classification of Tumors of the Testes in Relation to Prognosis. *Tr. Am. Assn. Gen.-Urin. Surg.*, **34**: 211, 1941.
- (16) HINMAN, F.: Tumor of Testes. Analysis of Results of Radical Operation. *Surg., Gynec., and Obst.*, **28**: 495, 1919.
- (17) KOBER, GEORGE MARTIN: Sarcoma of the Testicle. Conclusions Based on 114 Cases. *Am. Jour. Med. Sc.*, **117**: 535, 1899.
- (18) McNALLY, W.: Quoted by Ormond, J. K. and Prince, C. L.: Malignant Tumors of the Testicle. *Jour. Urol.*, **45**: 685, 1941.
- (19) RANDALL, A. AND CHAMBERLAIN, G. W.: Results of Treatment of Testicular Tumors. Analysis of Advantages of Preoperative X-Ray. *Tr. Am. Assn. Gen.-Urin. Surg.*, **33**: 297, 1941.
- (20) TANNER, C. O.: Tumors of the Testicle with Analysis of 100 Original Cases. *Surg., Gynec., and Obst.*, **35**: 565, 1922.
- (21) TWOMBLY, G. H., TEMPLE, N. M., AND DEAN, A. L.: Clinical Value of Aschheim-Zondek Test in Diagnosis of Testicular Tumors. *Jour. Am. Med. Assn.*, **118**: 106, 1942.
- (22) WESSON, M. B.: Tumors of the Testicle. Report of Some Unusual Cases. *Tr. Am. Assn. Gen.-Urin. Surg.*, **32**: 347, 1939.
- (23) ZONDEK, B.: *Monatschr. f. Geburtsh. u. Gynäk.*, **89**: 370, 1931.

THE INACTIVATION OF ESTRONE BY LIGHT*†‡

FRANK H. J. FIGGE, PH.D.

BALTIMORE, MD.

As early as 1925, before any of the estrogenic substances had been isolated and characterized, Allen and Ellis (1) found that ultraviolet light destroyed the estrogenic activity of ovarian extracts. They irradiated the residue from the lipoid extraction of the follicular contents of pig ovaries. The unfiltered radiation from a quartz mercury arc over a period of eighteen to twenty-four hours completely destroyed the activity of the estrogens present in the corn oil solutions of follicular extracts. The nonirradiated control preparations were active. More recently, apparently without knowledge of the earlier work, Laporta and Lafratta (7) subjected purified estrone in alcoholic solutions to quartz mercury arc radiations for two hours. They described certain changes in the melting point, ultraviolet absorption spectrum, and other physical properties of estrone resulting from the irradiation. They were unable to detect any variation in estrogenic activity corresponding to these changes in physical properties. The differences in results regarding estrogenic activity reported in these two investigations are probably related to differences in the technic and time of irradiation and difference in the methods of bio-assay of irradiation products. No definite attempt has been made to verify either of these reports because they were not discovered until near the completion of the experiments to be reported here. The claim of Allen and Ellis (1) that estrogenic substances were inactivated by light was, however, confirmed.

The fact that tyrosine and estrone had been found to undergo similar chemical changes when subjected to certain enzymes gave rise to the stimulus for the present investigation. Westerfeld (10) inactivated estrone by oxidation with a mushroom tyrosinase. Graubard and Pincus (5) reported that mushroom laccase oxidized estrogens in a 20 to 26 per cent alcohol solution, whereas both potato and mushroom tyrosinase failed to do so. They thought that Westerfeld's tyrosinase must have contained some laccase. Figge and Allen (3) found that estrone partially inhibited the oxidation of tyrosine by potato tyrosinase. The rate of oxidation of tyrosine was dependent on the relative concentrations of estrone and tyrosine. This competitive type of inhibition indicated that both substances could act as substrates for potato tyrosinase. Graubard and Pincus (6) repeated

* This investigation was aided by grants from the Anna Fuller Fund for Cancer Research and the Bressler Alumni Research Fund.

† From the Department of Anatomy, School of Medicine, University of Maryland.

‡ Received for publication November 24, 1942.

their own experiments, using water-soluble estrogen derivatives. They reaffirmed that mushroom tyrosinase does not oxidize or inactivate estrogens, but modified the previous statements regarding potato tyrosinase. Potato tyrosinase was found to oxidize estrogens to colored compounds that appeared to be completely inactive. Since potato tyrosinase is capable of oxidizing both estrogens and tyrosine (3, 6) and since ultraviolet light causes the oxidation of tyrosine (9), it was thought that ultraviolet light might also oxidize and inactivate estrone. This hypothesis is based on the fact that both tyrosine and estrone contain phenolic groups.

It was observed during a demonstration of the fluorescence of sex hormones (4) that near-ultraviolet light caused a change in the fluorescence of estrogens. When estrogens were freshly dissolved in 1 molar sodium hydroxide solutions they were blue fluorescent. After a few hours of irradiation with near-ultraviolet light the fluorescence changed from blue to green. It was desirable to know whether such a difference in fluorescence was accompanied by a change in estrogenic potency.

METHODS AND MATERIALS

The crystalline estrone was dissolved in a water solution. The estrone* (21.3 mg.) was first dissolved in 10 cc. of absolute ethyl alcohol. To this 10 cc. of 1 molar sodium hydroxide and 80 cc. of distilled water were added. Two 10 cc. portions of this stock solution were then diluted to 100 cc. with distilled water. One of these was not irradiated. It was designated as solution A and served as a control. The other was irradiated for eight to ten hours in an open beaker before being diluted to 100 cc. These two solutions, differing only in respect to the irradiation treatment, were diluted to give a series of solutions with decreasing concentrations. These concentrations were calculated so that 0.3 cc. of a given solution would contain the desired dosage, 6.4 to 0.2 micrograms. This was usually divided into three 0.1 cc. doses or two 0.15 cc. doses and injected subcutaneously into ovariectomized rats at intervals of eight and twelve hours. Vaginal smears were made at the end of fifty, fifty-six, and sixty hours after the first injection, or at only one of these times if cornified smears were observed. The rats were primed every second week or before each test injection with a dose of 3.2 or 6.4 micrograms of estrone.

RESULTS

The concentrations used, the number of tests, and the results may be seen in table I. The higher dosages, 1.6 to 6.4 micrograms of the nonirradiated control estrone solutions, induced cornification of the vagina in ovariecto-

* The estrone used was from a sample sent to Dr. Edgar Allen through the courtesy of Parke, Davis & Co.

mized rats in all tests. Seventy-nine per cent and 45 per cent of the rats responded positively to a dose of 0.8 and 0.4 micrograms respectively. The irradiated estrone solutions failed to cause cornification of the vagina even with higher dosages. In only three cases out of 103 tests were cornified cells observed in the vaginal smears of the rats injected with irradiated solutions of estrone. In these three cases the positive reactions were thought to be caused by the following circumstances:

The first series of irradiated solutions had been tested and found to be inactive in doses of 0.8 and 1.6 micrograms. These, as well as the control nonirradiated solutions, were stored in a dark refrigerator. After about three weeks in the dark the irradiated solutions began to show signs of

TABLE I

Influence of unfiltered quartz mercury arc radiations on the estrogenic activity of estrone

SOLUTION	ESTRONE MICROGRAMS, DOSAGE	TREATMENT	NUMBER OF ANIMALS INJECTED	NUMBER OF ANIMALS POSITIVE*
1A	6.4	Nonirrad.	138	138
2A	3.2	"	32	32
3A	1.6	"	20	20
4A	0.8	"	28	22
5A	0.4	"	20	9
6A	0.2	"	11	1
1B	6.4	(8 to 10 hours) Irradiated	16	0
2B	3.2	"	23	0
3B	1.6	"	24	2
4B	0.8	"	16	1
5B	0.4	"	12	0
6B	0.2	"	12	0

* Number of animals responding with cornified vaginal smears.

regaining some of their activity. This was indicated by the fact that cornified cells were observed in two of four animals injected with a dose of 1.6 micrograms and in one of four rats injected with 0.8 micrograms. Such a small but conspicuous inconsistent portion of the data indicates that the inactivating photochemical reaction induced by the irradiation of estrone may be reversible in the dark.

New solutions were made and irradiated for an initial period of eight to ten hours. When these were again used for tests at a later date they were irradiated for periods of one to two hours in open beakers just before injection. Cornified cells were never observed in rats injected with solutions of estrone subjected to such irradiation. The negative response in 100 per cent of the rats tested with 3.2 and 6.4 micrograms was obtained in this manner.

At the conclusion of the experiments large doses of the stock solution of irradiated estrone were injected. Previous to this injection the solution was irradiated in a pyrex Erlenmeyer flask instead of in an open beaker. The radiations shorter than 2900 Å were absorbed by this glass container and could have no influence upon the estrone solution. Large doses of this solution (32, 21.3, and 10.6 micrograms) gave a positive estrus response in sixteen, eight, and eight rats respectively. The results of this final experiment may be interpreted in several ways. It is possible that only 90 per cent of the original estrone present was destroyed or changed to inactive estrone by the initial irradiation. The actual dosages would thus have been 3.2 micrograms, 2.1 micrograms, and 1 microgram of active estrone. These dosages in all cases would have been sufficient to induce estrus reactions in all ovariectomized rats. However, this possibility is not supported by the other evidence. In the earlier experiments, using the same estrone solution freshly prepared and irradiated with unfiltered light, doses of as much as 6.4 micrograms were injected with completely negative results. If 10 per cent of this or 0.64 micrograms had been active estrone, approximately 50 per cent of the animals would have responded with estrus reactions. This did not occur. Apparently, the inactivating photochemical change which estrone undergoes when subjected to unfiltered quartz mercury arc irradiation is reversible. The wavelengths of light that passed through the pyrex glass evidently did not cause rapid photochemical inactivation of the estrone solutions which had gradually regained some of their original activity while in storage in the dark. This indicates that the most effective wavelengths for inactivating estrone are shorter than 2900 Å.

DISCUSSION

The actual alteration that estrone undergoes to become inactive is not known. In the case of inactivation with mushroom extracts, Westerfeld (10) postulated the oxidation of ring A to a quinone. According to the present knowledge it is the only reaction that a phenol oxidase could bring about in such a case. This hypothesis was, therefore, used to explain the action of estrone in releasing the enzyme tyrosinase from the inhibition caused by reduced glutathione (3). That the first stage of the reaction is the formation of a dihydroxyphenol also was implied in the discussion of other workers (6). A similar reaction is well established for tyrosine, both in the presence of phenoloxidases (2) and under the influence of ultraviolet irradiation (9).

On the basis of their physical and chemical examinations and a bio-assay of the irradiation products of estrone, Laporta and Lafratta (7) presented an entirely different hypothesis. They expressed the view that light converts some of the estrone to estradiol and some to estriol. The product of the

irradiation is a mixture of all three. Since estradiol is more active and estriol less active than estrone, such a mixture as they postulate could have estrogenic activity equal to that of pure estrone. Although this served to explain their inability to detect any difference in estrogenic potency in irradiated and nonirradiated preparations, it was not supported by some of their chemical data that appeared to be far more accurate than the methods they employed for the bio-assays. They used the colorimetric method for determination of estrone devised by Schmulovitz and Wylie (8). This color reaction depends on the presence of the phenolic hydroxyl group. After two hours' irradiation the Schmulovitz-Wylie color reaction indicated the photochemical destruction of approximately 50 per cent of the original estrone. If this had been merely converted to estradiol or estriol, the Schmulovitz-Wylie color reaction would not have altered. Laporta and Lafratta's interpretation of their results was not supported by their data.

All the available data thus indicates that light inactivates estrone by causing the oxidation of ring A to a quinone and that in the dark this photochemical reaction is, at least, partially reversible. The fact that light controls the relative amount of active and inactive estrone in a given solution may have a bearing on the present methods of evaluating the potency of such preparations. It may also explain some of the great discrepancies between the chemical or colorimetric methods of determination and bio-assay. The assumption by other investigators that the inactivating photochemical change is caused by wavelengths in the ultraviolet is probably correct, but so far no one has irradiated with monochromatic light. If it should be found that either the visible or near-ultraviolet wavelengths are capable of inducing even slow photochemical inactivation of estrone, methods of excluding these wavelengths from commercial preparations and research materials would be imperative.

SUMMARY

The unfiltered radiation from a quartz mercury arc inactivates aqueous solutions of estrone. This photochemical change of estrone may be reversible in the dark.

BIBLIOGRAPHY

- (1) ALLEN, EDGAR AND ELLIS, M. M.: The Effect of Ultraviolet Rays on the Hormones of the Ovarian Follicle and Placenta. *Jour. Am. Med. Assn.*, **85**: 94, 1925.
- (2) EVANS, WM. C. AND RAPER, HENRY S.: The Accumulation of *3*:*4*-dihydroxyphenylalanine in the Tyrosinase-Tyrosine Reaction. *Biochem. Jour.*, **31**: 2162, 1937.
- (3) FIGGE, FRANK H. J. AND ALLEN, EDGAR: Release of Glutathione Inhibition of Melanin Formation by Estrone. *Endocrinology*, **29**: 262, 1941.
- (4) FIGGE, FRANK H. J., ALLEN, EDGAR, AND STRONG, L. C.: Fluorescence Phenomena Observed during Studies on Cancer-Susceptibility and Sex Hormones. *Anat. Rec.*, **82**: 92, 1942.

- (5) GRAUBARD, MARK AND PINCUS, GREGORY: The Oxidation of Estrogens by Phenolases. *Proc. Nat. Acad. Sc.*, **27**: 149, 1941.
- (6) GRAUBARD, MARK AND PINCUS, GREGORY: Steroid Metabolism: Estrogens and Phenolases. *Endocrinology*, **30**: 265, 1942.
- (7) LAPORTA, D. M. AND LAFRATTA, E.: Transformazioni Fotochimiche Indotte Dalla Irradiazione Ultravioletta Nell 'Estrone. *Arch. d. sci. biol.*, **24**: 452, 1938.
- (8) SCHMULOVITZ, MAURICE J. AND WYLIE, H. BOYD: The Chemical Estimation of Theelin with Diazobenzensulfonic Acid. *Jour. Biol. Chem.*, **116**: 415, 1936.
- (9) SPIEGEL-ADOLPH, M.: Studies on Melanins. I. Photosynthetic Melanins. *Biochem. Jour.*, **31**: 1303, 1937.
- (10) WESTERFELD, W. W.: The Inactivation of Oestrone. *Biochem. Jour.*, **34**: 51, 1940.

CARCINOMA OF THE ESOPHAGUS: REPORT OF A CASE WITH RESECTION AND ESOPHAGOGASTROSTOMY*†

O. C. BRANTIGAN, M.D. AND A. M. SHIPLEY, M.D., Sc.D.

BALTIMORE, MD.

There is an ever increasing number of reports dealing with carcinoma of the esophagus and the surgical attack upon this lesion. Torek (3) in 1913 reported the first successful resection of the midportion of the esophagus in a woman sixty-seven years of age, who died thirteen years later from pneumonia. Adams, Escudero, Aronsohn, and Shaw (1) in 1938 reported that thirty-four successful resections of the esophagus had been done by eighteen different operators, and Stephens (2) in 1942 reported on twenty-three cases with sixteen resections.

To advance the surgery of the esophagus Eggers recommended that all cases operated upon be reported. For this reason the following cases by the authors are being enumerated.

1. Two cases of esophagocardiogastric carcinoma were explored through a left rectus incision and found inoperable.

2. A patient with carcinoma of the middle third of the esophagus was explored and found inoperable because of metastases, whereas a second similar lesion was removed successfully. The patient had a smooth postoperative course with primary wound healing but died twenty-one days after the operation because of a malfunctioning gastrostomy.

3. A thoracic approach was made for a carcinoma of the lower third of the esophagus. The tumor was small and freely movable. However, when the diaphragm was opened, palpation of the liver proved it to be studded with small metastatic nodules.

A successful resection of the lower third of the esophagus for carcinoma is here reported in detail.

CASE REPORT

H. R., a white male, age 56, University Hospital No. 50,695, was admitted on March 31, 1942. The operation was done on April 9 and the patient discharged on June 9. He had always been in good health until four weeks before admission, when he began to have epigastric pain which was relieved by vomiting. The vomitus never contained blood. Two weeks before admission the symptoms became so severe that the patient began to take only liquids, but vomiting continued despite this. He lost forty-four pounds in weight in the three months preceding admission.

A physical examination revealed weakness, evidence of recent weight loss, carious teeth, and an emphysematous chest. The systolic blood pressure was 140 mm. and the diastolic pressure was 90 mm. Otherwise the findings of the examination were entirely normal.

* From the Department of Surgery, School of Medicine, University of Maryland.

† Received for publication October 7, 1942.

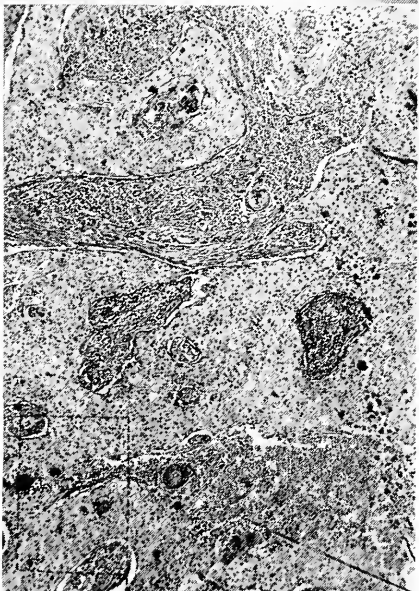
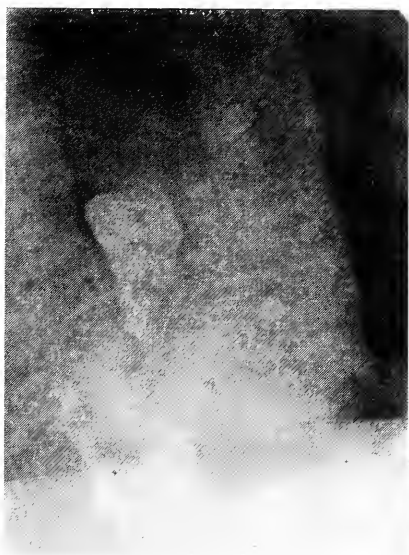


FIG. 1 (top)
FIG. 3 (bottom)

FIG. 2 (top)
FIG. 4 (bottom)

FIG. 1. The roentgenograph shows the esophageal obstruction as outlined by barium sulfate before operation.

FIG. 2. This roentgenograph was taken before operation but after initiation of pneumothorax. It indicates the extent of pleural adhesions.

FIG. 3. The specimen removed at operation and photographed after being fixed in formalin.

FIG. 4. A photomicrograph (low power) shows a section taken from the surgical specimen. It is characteristically a squamous cell carcinoma. The dotted square indicates the area where the high power photomicrograph was taken.

Thorough laboratory studies were made, including urinalysis, hemogram, blood chemistry, liver function test, venous pressure determination, circulation time, vital capacity, electrocardiogram, and a roentgenograph of the chest and spine. All were within normal limits. The abnormal findings were as follows: A fluoroscopic examination of the esophagus revealed an obstructive lesion 4 cm. in size above the diaphragm; this was confirmed by a roentgenograph. The blood chemical examination showed hemoglobin 82%, white blood cells 11,600, vitamin C content 0.367 mg. %, and nonprotein nitrogen 44 mg. %. The two hour excretion of phenolsulphonphthalein was 45%.

An esophagoscopy revealed a fungating mass in the esophagus 33 cm. from the upper incisor teeth; a biopsy of the mass was made and microscopic examination revealed a squamous cell carcinoma.

In preparation for surgery the patient was given a high caloric, high vitamin liquid diet of which he retained about 500 cc. in twenty-four hours. This was supplemented daily by 2500 cc. of 10% glucose in physiologic saline given intravenously. Parenteral vitamins were given in adequate amounts. The oral hygiene was carried out by a dentist. Pneumothorax was instituted on the left side as a preliminary measure to operation. Two days before operation the patient was given one gram of sulfathiazole every four hours. The day preceding the operation 500 cc. of citrated whole blood was also given. The preoperative treatment resulted in a reduction of the nonprotein nitrogen to 20 mg. % and an increase in the phenolsulphonphthalein to a 55% excretion in two hours. The hemoglobin changed from 82 to 74%, but the leukocyte count remained stationary. It is evident that these changes resulted from overcoming dehydration. The vitamin C content of the blood increased to 0.47 mg. %.

The operation was performed on April 9, 1942. A dose of 1/100 grain of atropine was the only preoperative medication. Intratracheal ether was used throughout as an anesthetic. A long incision was made through the eighth intercostal space. After first securing the intercostal arteries the sixth, seventh, eighth, and ninth ribs were cut adjacent to their corresponding transverse processes. The tumor involving the lower portion of the esophagus could be defined clearly and there was no evidence of metastases. The phrenic nerve was crushed and the diaphragm then opened from the esophageal hiatus to its periphery. The liver was palpated and no metastases were found. By means of sharp and blunt dissection the esophagus and tumor were freed with considerable difficulty. The bleeding was controlled as encountered. While freeing the tumor itself, the right pleural cavity was entered. This sucking wound was closed quickly with a wet pack which remained in place until the thorax was ready to be closed. Because the growth was adherent to the diaphragm, about one inch or more of the diaphragm about the periphery of the esophageal hiatus was excised with the growth. The left gastric and the left gastro-colic arteries were divided and ligated. Clamps were placed across the esophagus above the growth about 2 cm. below the aortic arch. Clamps also were placed across the fundus of the stomach well below the tumor. The intervening portion was excised with a knife previously treated with phenol. About 4 to 6 cm. of stomach were thus removed together with the lower third of the esophagus and its tumor. The opening into the stomach was closed in a routine manner. The gastrocolic ligament was freed from a portion of the greater curvature of the stomach and a corresponding portion of the gastrohepatic ligament from the lesser curvature of the stomach, thus permitting the greater portion of the stomach to be delivered into the thoracic cavity. An opening which corresponded to the greater curvature was made into the stomach and the esophagus anastomosed to it by the open method. The anastomosis by necessity was made approximately 2 cm. below the arch of the aorta. In order to relieve tension from the anastomotic suture line the stomach was sutured to the pleura covering the arch of the aorta, and also along the descending thoracic

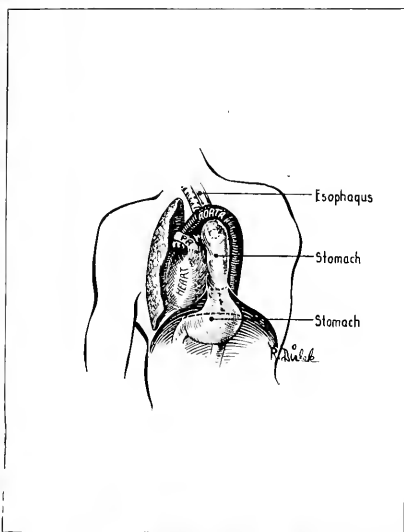
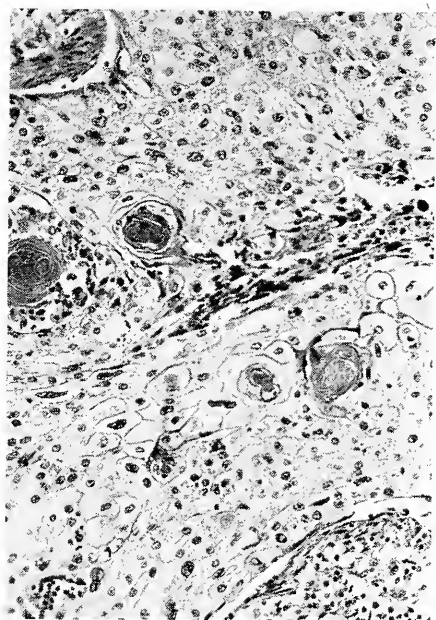


FIG. 5 (top)
FIG. 7 (bottom)

FIG. 6 (top)
FIG. 8 (bottom)

FIG. 5. Photomicrograph (high power) taken from Fig. 4, as indicated by the dotted square.

FIG. 6. The drawing illustrates well the actual height at which the stomach was delivered into the thoracic cavity (Fig. 7). At operation the stomach was anchored securely by interrupted silk sutures to the pleura covering the arch of the aorta and the descending aorta. The sutures are not illustrated in the drawing. That the stomach can be delivered so high in the pleural cavity is worthy of note. →

aorta. The suture line closing the fundic stomach resection was in relation to the mediastinum. The diaphragm was sutured loosely to the stomach and the incision in the diaphragm closed with interrupted sutures. A small nasal tube was passed through the esophagus and into the stomach. The chest wall was closed in layers by using interrupted chromic catgut sutures. This incision was drained superficially. The pleural cavity was drained through the tenth interspace. Before closure of the chest wall 8 grams of sulfanilimide was placed in the pleural cavity.

Prior to the operation the pulse rate was 100 and respirations were 24 per minute; at the finish of the operation the pulse rate was 144 and the rate of respirations 36 per minute. While in the surgery the patient received 1000 cc. of glucose, 500 cc. of physiologically normal saline, 1000 cc. of citrated whole blood, 15 min. of 1:1000 adrenalin, and 1/150 grain of atropine.

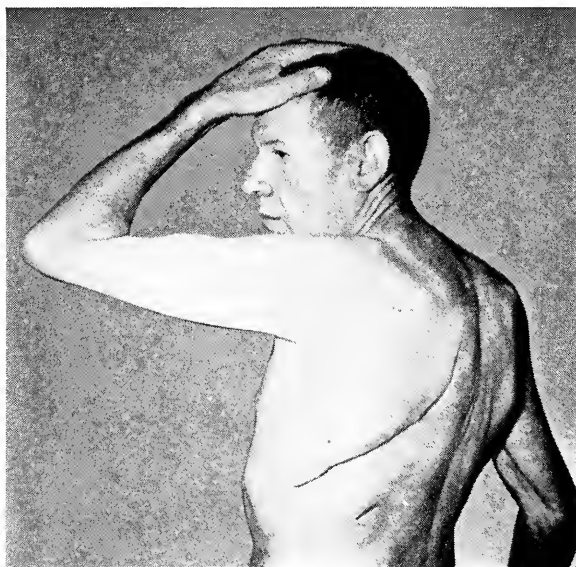


FIG. 9. A photograph of the patient taken July 28, 1942. It shows his nutritional state and the incisional scars.

Upon returning from the operating room the patient was given intranasal oxygen, citrated whole blood, blood plasma, and adrenal cortex intravenously, as well as glucose in saline subcutaneously. In spite of this treatment he lapsed into shock. With appropriate shock treatment he fully recovered by the eighth postoperative hour and was not troubled by shock again.

FIG. 7. The roentgenograph shows the barium sulfate passing through the esophagus into the stomach. The constrictions noted in the esophagus are normal contractions. Fluoroscopic examination revealed no constriction or obstruction to the flow of barium. The stomach maintains a tubular contour above the diaphragm. The curve of the esophagus as it turns under the aortic arch is well shown. The stomach is held above the level of the esophageal anastomosis because it is sutured to the pleura covering the aortic arch.

FIG. 8. A chest roentgenograph taken of the patient before his discharge from the hospital.

Intranasal oxygen was continued for three days. The gastric siphonage tube was taken out by the patient the first day. It was reinserted carefully the second day, but again he promptly removed it. The pleural drainage tube was connected to suction of 2 cm. of mercury negative pressure. The tube drained well the first day but ceased to drain afterward. It was removed on the eleventh day. The incision drained serous fluid at first but the drainage later became purulent. The wound did not break down. There was a drainage tract when he was discharged from the hospital.

The patient was started on one-half ounce of water every hour on the fourth postoperative day, and because he tolerated this well it was increased to one ounce each hour the next day. On the sixth day he was given orange juice with egg albumen every two hours. His diet was increased on the tenth day to 1500 cc. of liquid containing 3000 calories. He was also allowed water as desired. A full soft diet was permitted on the eighteenth postoperative day.

The day after operation the total proteins were 6.42 mg. %. They continued to drop gradually and reached 5.0 mg. % on the eleventh postoperative day. However, the total proteins began to increase after this and reached 5.89% on the fourteenth day. On the twenty-fifth day the total proteins were 7.87 mg. % and continued to be normal thereafter.

The temperature before operation ranged between 99 and 100 F., with a pulse rate of between 62 and 90, and respirations between 20 and 25. For the first six days after operation the highest temperature was 100.4 F. rectally. On the seventh postoperative day it reached 102.4 F. rectally but promptly dropped to the former range, only to reach 101.8 F. on the tenth day. For the most part it was normal thereafter. The pulse rate was between 110 and 130 per minute for the first eight days and then gradually dropped to a range of between 70 and 90 at the time of discharge. The respirations were labored for a few days after operation but not particularly rapid at any time.

At the time of discharge a complete blood study revealed all determinations to be within normal limits. The urine was normal. There was no change in the electrocardiogram. The esophagus and stomach were functioning normally. The circulation time and venous pressures had not changed. The vital capacity had decreased from 3900 to 2800 cc.

COMMENT

Because the carcinoma in this case was so large it was necessary to resect the esophagus within 2 cm. of the aortic arch. In spite of this high resection it was possible to deliver the stomach into the thoracic cavity high enough to bridge the gap and still not interfere with its blood supply or its healing power. The stomach lost its contour and really became a tubular structure.

The only secure suture in the anastomosis was the first or innermost through and through suture. The reinforcing sutures did not hold firmly in the esophageal musculature, therefore it was imperative to relieve all tension from the suture line. This was accomplished by suturing the stomach to the pleura covering the arch of the aorta and along the descending aorta.

Since the esophagus is normally related to the mediastinal pleura throughout the right side, except where crossed by the azygos vein, it seems almost impossible to remove a growth of any magnitude without entering the right pleural cavity. An opening into the right pleural cavity in this case caused

no real embarrassment to the patient either during the operation or throughout the postoperative period. The opening was controlled easily by covering it with a moist pack until the operation was completed.

Both vagi had to be severed, but since the operation the patient has had no abnormal gastrointestinal symptoms. He was never nauseated and did not vomit. There was no abdominal distention and the bowel movements were normal.

It seems evident from the drainage that some infection occurred in the left pleural cavity, but even though the diaphragm was only loosely sutured about the stomach there was at no time any peritoneal irritation.

CONCLUSIONS

A successful esophageal resection with esophagogastrostomy is reported. The absence of postoperative suffering, the ability to eat normally and again carry on a normal existence makes the operation worth while even though the patient should live only a few months.

BIBLIOGRAPHY

- (1) ADAMS, W. E., ESCUDERO, L., ARONSOHN, H. G., AND SHAW, M. M.: Resection of the Thoracic Esophagus. *Jour. Thoracic Surg.*, **7**: 605, 1937-1938.
- (2) STEPHENS, H. B.: Cancer of the Thoracic Esophagus and the Upper End of the Stomach. *Jour. Thoracic Surg.*, **2**: 469, 1942.
- (3) TOREK, F.: The First Successful Resection of the Thoracic Portion of the Esophagus for Carcinoma: Preliminary Report. *Jour. Am. Med. Assn.*, **60**: 1533, 1913.

PROCEEDINGS
of the
University of Maryland Biological Society

Officers of the Society

Marion W. McCrea, *President*
School of Dentistry
Baltimore, Md.

Sylvan Forman, *Treasurer*
School of Medicine
Baltimore, Md.

Robert H. Oster, *Secretary*
School of Medicine
Baltimore, Md.

Ronald Bamford, *Secretarial Representative*
Department of Botany
College Park, Md.

Councillors

Walter H. Hartung
Edward C. Dobbs
C. Jelleff Carr
Thomas C. Grubb

ONE HUNDRED AND TWENTIETH PROGRAM MEETING

The One Hundred and Twentieth Program Meeting was held on Wednesday, October 28, 1942, at 4:00 P.M. in the Bressler Lecture Hall.

Prof. E. V. McCollum of the School of Hygiene and Public Health, Johns Hopkins University, presented a paper on "Nutritional Problems in War-time."

ONE HUNDRED AND TWENTY-FIRST PROGRAM MEETING

The One Hundred and Twenty-First Program Meeting was held on Wednesday, December 2, 1942, at 4:15 P.M. in the Bressler Lecture Hall. The program consisted of the following papers:

"Studies on Protection against Chemical Warfare Agents," by Dr. C. Jelleff Carr, Department of Pharmacology, School of Medicine, University of Maryland.

"Influence of Pantothenic Deficient Diets on the Female Sex Tract in Rats," by Dr. Frank H. J. Figge, Department of Anatomy, School of Medicine, University of Maryland.

Abstracts of these papers follow.

The annual business meeting was held.

STUDIES ON PROTECTION AGAINST CHEMICAL WARFARE AGENTS

C. JELLEFF CARR, PH.D.*

A general review of the physiologic classification of the chemical warfare agents was presented. The vesicants were considered in detail insofar as these agents may be used upon civilian groups. The subject was considered from the standpoint of a mass toxicologic problem. A review of the literature on the subject reveals considerable opportunity for experimental investigation and fundamental studies of these agents, especially since this problem is closely associated with the clinical medical problem of hypersensitivity. The formation of many pigmented chromatophores in the upper corium after a mustard gas burn suggests a relationship between cellular metabolism, para-amino benzoic acid, and thiamin concentration. A description was given of the results obtained in a series of experiments with antigas films when prophylactic films were applied to experimental animals. Certain types of hydrophylic gels will afford considerable protection against the vapors of vesicant agents.

GENITAL ATROPHY IN RATS INDUCED BY DIETS DEFICIENT IN PANTOTHENIC ACID AND THE RESPONSE TO GONADOTROPIN AND ESTROGEN

FRANK H. J. FIGGE, PH.D.†

In some twenty-one day old female rats that had been maintained for eight weeks on diets deficient in pantothenic acid to study the source of porphyrin incrustations the sex tracts appeared to be small and atrophic as compared with the controls. Histologic examination of these tissues revealed the fact that the corpora lutea were abundant in the ovaries of the controls but absent in the ovaries of rats fed a diet deficient in pantothenic acid. Correspondingly, the entire sex tract in the deficient animals remained infantile and atrophic. This failure to ovulate had not been described in any of the papers on the histopathology of this deficiency. It was therefore desirable to repeat this experiment more carefully and to determine the response of these atrophic genital tracts to injections of gonadotropic hormones and estrogens.

The experiment was repeated with sixty additional female rats, thirty-six being placed on pantothenic acid deficient diets, and twenty-four controls maintained on the same diet plus pantothenic acid. In thirty-five of the thirty-six animals on deficient diets the vagina had not opened at the age of eighty-eight days. In the twenty-four controls the vagina opened between forty and forty-five days of age, and cornified smears indicated regular estrus cycles at intervals of four to six days. The genital organs of the pantothenic deficient animals were extremely atrophic. The vaginal epithelium was only two layers thick, and the uterus was tiny and infantile. Both organs were even more atrophic than after ovariectomy. A study of the ovaries in most cases showed failure of ovulation. The largest follicles were of medium size and similar to those of hypophysectomized animals.

Gonadotropic and estrogenic hormones were injected into the animals maintained on pantothenic acid deficiency and typical responses were obtained at the expected times. The gonadotropic hormones restored the atrophic sex tracts to almost normal size and appearance in less than five days. The addition of pantothenic acid to the deficient diet also restored the sex tract to normal, but required much more time and in addition affected other symptoms of the deficiency. There is thus some indication that pantothenic acid is essential for the elaboration of gonadotropic and perhaps other hypophyseal hormones.

*Department of Pharmacology, School of Medicine, University of Maryland.

†From the Department of Anatomy, School of Medicine, University of Maryland.

ALUMNI ASSOCIATION SECTION

OFFICERS

HENRY J. WALTON, M.D., *President*

Vice-Presidents

REAR ADMIRAL CHARLES H. T. LOWNDES J. WALTER LAYMAN, M.D. FREDERICK W. STEINER, M.D.
BENJAMIN S. RICH, M.D., *Secretary* KENNETH LEGGE, M.D., *Assistant Secretary*

EDWARD P. SMITH, M.D., *Treasurer*

Board of Directors

WALTER D. WISE, M.D.,

Chairman

HENRY J. WALTON, M.D.
EDGAR B. FRIEDENWALD, M.D.
BENJAMIN S. RICH, M.D.
GEORGE MCLEAN, M.D.
WILLIAM H. SMITH, M.D.
EDWARD P. SMITH, M.D.
CHARLES REIFSCHNEIDER, M.D.
KENNETH LEGGE, M.D.

Hospital Council

ALFRED T. GUNDRY, M.D.

GEORGE SARGENT, M.D.

Nominating Committee

JOHN E. SAVAGE, M.D.

Chairman

OLIVER S. LLOYD, M.D.

J. SHELDON EASTLAND, M.D.

WILLIAM SEABOLD, M.D.

FRANK GERAGHTY, M.D.

Library Committee

WILLIAM S. LOVE, JR., M.D.

Trustee Students' Rotating Fund

FRANCIS J. KIRBY, M.D.,

Chairman

R. L. MITCHELL, M.D.

A. F. RIES, M.D.

EUGENE HAYWARD, M.D.

Editors

EMIL NOVAK, M.D.

C. GARDNER WARNER, M.D.

Alumni Council

WILLIAM H. TRIPLETT, M.D.

THOMAS B. AYCOCK, M.D.

The names listed above are officers for the term beginning July 1, 1942 and ending June 30, 1943

SPRING ACTIVITIES

The Board of Regents, the President and the Board of Directors of the Alumni Association, together with the Dean and Medical Council of the School of Medicine of the University of Maryland, cordially invite you to attend the spring activities.

PROGRAM

March 24, 1943

- 9:00 A.M.—Registration at the Students' Lounge, first floor, Gray Laboratory.
10:00 A.M.—12 M.—Inspection of University Hospital and School of Medicine.
1:00 P.M.—Luncheon and Annual Meeting of the Medical Alumni Association, Nurses' Dining Room, University Hospital.
7:00 P.M.—Annual Banquet, Lord Baltimore Hotel.

REUNIONS

The following classes have expressed their intention to hold reunions this year:

1893	1908	1928
1898	1913	1933
1903	1918	1938
	1923	

NOTE: The reunions will include the graduates from the College of Physicians and Surgeons, University of Maryland and the Baltimore Medical College. Any other classes desiring to hold reunions will please communicate with the Medical Alumni Office, Lombard and Greene Streets, Baltimore, Maryland, which will be pleased to help in every possible way to make the affair a success.

March 25, 1943

8 P.M.—Commencement Exercises, Lyric Theatre, Baltimore, Md.

Secretary of the Medical Alumni Association.

Kindly send ticket. for the Alumni Banquet of the Medical Alumni Association, University of Maryland, to be held at the Lord Baltimore Hotel on Wednesday evening, March 24, 1943 at 7 P.M.

will

I *or* be present for the banquet.

will not

Enclosed please find subscription at \$3.00 per ticket.

Name

Address

(Detach and mail to: MEDICAL ALUMNI ASSOCIATION
Lombard and Greene Streets, Baltimore, Md.)

Programs may be obtained at the time of registration.

ITEMS

Dr. Harry M. Robinson, Sr., Professor of Dermatology, was guest speaker at the annual meeting of the Pennsylvania State Medical Society which was held on October 6, 1942 at Pittsburgh, Pennsylvania. The subject of his address was "The Resumption of Antisymphilic Treatment after Postarsphenamine Reactions."

Dr. Bernhard Goldmann, Class of 1922, is chairman of the Dermatologic Section of the Pennsylvania State Medical Society. He formerly held the position of secretary of the organization.

MEDICAL LIBRARY NOTES

REORGANIZATION

A change in the administrative organization of the libraries of the Schools of Medicine, Pharmacy and Dentistry was effected on October 1, 1942. Under the new plan one individual is responsible for general supervision over

all three libraries under the direction of the university librarian. It is expected that this change will result in improved service and more effective practices without interfering with the individual identities of the three libraries.

Miss Thelma Wiles, who has been in charge of the Dental-Pharmacy Library since January, 1941, has been appointed to this supervisory position. Miss Wiles received her degree in library science from the University of Michigan and served on the staff of the general library in College Park for three years prior to 1941.

The staff of the Medical Library has also been strengthened considerably by the addition of a cataloger. Miss Edith R. McIntosh, a graduate of the University of North Carolina School of Library Science, was appointed to this position on December 1. Miss McIntosh has served on the staff of the library of Millsaps College and the University of North Carolina.

1941-1942 IN BRIEF

Between October 1, 1941 and September 30, 1942, 854 volumes were added to the Medical Library, bringing the collection to a total of 22,115 volumes. The number of books loaned for home use was 4937. The rare historical books were moved to College Park for the duration as a precaution against possible air raid damage. Several exhibits of these were held.

MILITARY MEDICINE

A collection of books on military medicine and related subjects has been assembled. These have been placed in a special section of the shelves and so designated. Many of the books bear recent publication dates and are well worth examining.

OBITUARIES

MAJOR THOMAS J. COONAN

Major Thomas J. Coonan died in Australia on November 3, 1942. While serving as a member of the University of Maryland Unit he sustained a severe head injury which proved fatal.

Dr. Coonan was born in Westminster, Maryland on February 15, 1901, the son of Blanche Bennett Coonan and Dr. Thomas J. Coonan. He was one of twelve children. After his preliminary education in Westminster he entered Western Maryland College but left there at the age of seventeen to enlist in the Marine Corps during the First World War. However, before Dr. Coonan finished his training at Quantico the war was over and he returned to Western Maryland College. After receiving his degree, he entered the School of Medicine of the University of Maryland in 1921 and graduated in 1925. He interned at the University Hospital and then took up the practice of pediatrics, being associated with the late Dr. John Ruhrah.

Before entering the Army Major Coonan was a member of the teaching staff at the University, a member of the staff at Mercy Hospital, and consultant at the South Baltimore General Hospital. Also, he was medical director for the Chesapeake and Potomac Telephone Company in Baltimore.

When a unit of the University Hospital was being formed in 1940 Dr. Coonan was among the first to volunteer for service. He received his commission as Major in 1941 and left Baltimore with the Unit in April, 1942.

These facts and dates tell little of the real Tom Coonan, the fine young doctor who took such good care of the children who came to him for treatment. When he made his daily rounds in the ward at Mercy Hospital all the little heads would pop up over the cribs to smile at him and beg for another balloon, of which he always carried a generous supply. There is a story told of a youngster, in this same ward, whom Dr. Coonan had been treating for months for rheumatic heart disease. He encouraged the boy by telling him that he would be well enough to go to see the fireworks on the Fourth of July. July came and with it the usual celebrations, but the child's father had to go out of town on that particular red-letter day and the boy told this sad story to Dr. Coonan when he visited the ward on the morning of the Fourth. Strangely enough the doctor listened to his tale of woe and left without comment. However, at about 7 p.m. Dr. Coonan called the ward supervisor and asked her to dress the boy immediately for he was coming to take him to the fireworks. These are small things but they show the warm quiet kindness of Tom Coonan. All who had the privilege of knowing him held him in high esteem, for Tom was always sympathetic with young and old, an inheritance from a long line of ancestors in the medical profession.

When the sad news was received in Baltimore of the passing of Major Coonan a mass was celebrated in the chapel at Mercy Hospital for the repose of his soul on November 11, 1942. Reverend Francis J. McVeigh, S.J., delivered a short eulogy in which he said: "While Major Coonan had not died in battle, he was truly a hero, for he made the great sacrifice in



MAJOR THOMAS J. COONAN

answering his country's call for volunteers from the medical profession. And, he willingly went to the far ends of the earth to serve his country and to save the lives of the wounded." Tom Coonan, brave of heart and great of soul, did all that he could. His memory will live on in the hearts of those who knew and loved him.

THOMAS K. GALVIN, M.D.

ROBERT LEVIS MITCHELL, M.D.

Dr. Robert Levis Mitchell of Baltimore died on December 13, 1941 in the Maryland General Hospital.

Dr. Mitchell was born at Elkton, Cecil County, Maryland on June 25, 1881, the son of Mary Levis and Arthur Whitely Mitchell. He attended a private school in Elkton and then went to the Cecil County High School. Following a two year scientific course at Delaware College he entered the Maryland School of Pharmacy, from which he received the degree of Doctor of Pharmacy in 1902. Three years later he graduated from the School of Medicine of the University of Maryland. He was resident gynecologist at the University Hospital from 1905 to 1907 and started private practice in 1907.

From 1907 to 1909 Dr. Mitchell was assistant demonstrator of anatomy in the School of Medicine and assistant demonstrator in embryology and histology from 1908 to 1910. He was instructor in gynecology for a number of years and chief of the gynecology outpatient clinic from 1907 to 1912. Dr. Mitchell also was an instructor in pathology and bacteriology in the School of Dentistry from 1912 to 1917 and was professor of both branches from 1919 to the time of his death. He was professor of hygiene and physiology in the School of Pharmacy from 1919 to 1931.

Dr. Mitchell was instrumental in reorganizing the Medical Alumni Association and served as its president. He was a member of several medical societies and medical clubs.

During the last few years Dr. Mitchell worked under a serious handicap because of failing health. In spite of this he was always thoughtful, gracious, and devoted to his friends and patients. He will be greatly missed as a kind, sympathetic medical adviser and a loyal friend.

C. A. REIFSCHNEIDER, M.D.

Abbott, Luther M., New Castle, Va.; B.M.C., class of 1898; aged 72; died, August 16, 1942, of hypertension and heart disease.

Armentrout, John F., Roanoke, Va.; class of 1903; aged 75; died, September 28, 1942, of heart disease.

Barber, Robert T. J., Washington, D. C.; P. & S., class of 1886; aged 80; died, August 8, 1942, of coronary sclerosis.

Blackshear, Thomas Edward, Pensacola, Fla.; class of 1894; aged 71; died, September 7, 1942, of coronary thrombosis.

Brantley, Cornelius H., Bailey, N. C.; P. & S., class of 1887; aged 82; died, July 31, 1942.

Burke, F. Edward, Wakefield, R. I.; P. & S., class of 1898; aged 77; died, October 21, 1942.

- Christopherson, Willard**, Salt Lake City, Utah; P. & S., class of 1912; aged 64; died, July 8, 1942, of cerebral hemorrhage.
- Crosby, Theodore Smith**, Ironwood, Mich.; P. & S., class of 1905; served during World War I; aged 64; died, July 18, 1942, of nephrosclerosis with uremia.
- Darlington, John William**, Valley Falls, Kan.; P. & S., class of 1887; aged 88; died, August 21, 1942, of carcinoma of the rectum.
- Deitrick, Joseph Lynn**, Norfolk, Va.; class of 1891; aged 74; died, August 30, 1942, of acute coronary occlusion.
- Downing, Francis**, Norwich, Conn.; B.M.C., class of 1908; aged 60; died, August 10, 1942.
- Engle, Oliver C.**, Yardley, Pa.; class of 1887; aged 85; died, July 12, 1942, of complications following fracture of the hip.
- Guistwhite, Bruce Hetrick**, Washington, D. C.; class of 1914; served during World War I; aged 54; died, June 3, 1942, of cerebral hemorrhage.
- Harr, Harry Thomas**, Fayetteville, Ark.; class of 1892; aged 73; died, in September, 1942.
- Harris, Allan**, Greenwich, N. J.; B.M.C., class of 1902; aged 70; died, November 5, 1942.
- Hauser, Byron B.**, Hooper, Neb.; P. & S., class of 1898; aged 70; died, June 14, 1942, of diabetes mellitus.
- Hicks, Claude Bernard**, Atlanta, Ga.; class of 1914; aged 56; died, June 24, 1942, of chronic nephritis.
- Hobelmann, Frederick William**, Baltimore, Md.; aged 66; died, June 14, 1942, of heart disease and bronchiogenic carcinoma.
- Kleiser, Arthur J.**, Waveland, Ind.; P. & S., class of 1885; aged 80; died, August 20, 1942, of cerebral hemorrhage.
- MacDonald, Daniel**, Sydney, N. S., Canada; P. & S., class of 1892; served during World War I; aged 81; died, July 31, 1942.
- Mahoney, Daniel Patrick**, Saint John, N. B., Canada; P. & S., class of 1905; aged 68; died, May 31, 1942.
- Matthews, William Johnson**, Johnson City, Tenn.; P. & S., class of 1892; aged 75; died, August 28, 1942, of coronary thrombosis.
- Miller, Frank Oldham**, Ellicott City, Md.; served during World War I; aged 64; died, August 25, 1942, of arteriosclerosis and coronary thrombosis.
- Moulton, John Franklin**, Lafayette, La.; P. & S., class of 1889; aged 74; died, September 3, 1942.
- Skinner, Louis Cotten**, Greenville, N. C.; class of 1901; aged 62; died, September 20, 1942.
- Smart, L. Gibbons**, Towson, Md.; P. & S., class of 1885; aged 80; died, September 1, 1942.

- Smith, Gilbert Tyson**, McDaniel, Md.; class of 1897; aged 68; died, September 22, 1942.
- Smith, Howard Marshall**, Richmond, Va.; class of 1889; aged 75; died, July 4, 1942, of heart disease.
- Southall, James Arden**, Hopkinsville, Ky.; P. & S., class of 1883; aged 82; died, June 20, 1942, of arteriosclerosis.
- Steward, William J.**, Quarryville, Pa.; class of 1904; aged 64; died, June 20, 1942, of heart disease.
- Streett, Sidney Hamilton**, Baltimore, Md.; B.M.C., class of 1908; served during World War I; aged 59; died, June 29, 1942, of coronary thrombosis.
- Terrell, Scurry Latimer**, El Paso, Tex.; P. & S., class of 1895; served with the British Army and later with the U. S. Army during World War I; aged 72; died, July 12, 1942.
- Thorp, Walter Perry**, Winburne, Pa.; B.M.C., class of 1905; aged 68; died, October 19, 1942, at Clearfield, Pa. of cardiac insufficiency.
- Walsh, Charles Joseph**, Gilbertville, Mass.; P. & S., class of 1892; aged 83; died, September 6, 1942, of cardiorenal disease.
- Winner, Jacob Louis**, Baltimore, Md.; aged 70; died, June 21, 1942, of arteriosclerosis.
- Wood, Amos DeRussia**, Bluefield, W. Va.; P. & S., class of 1893; aged 73; died, September 14, 1942, of carcinoma of the stomach.
- Woodruff, Charles S.**, Baltimore, Md.; class of 1891; aged 73; died recently of chronic nephritis.
- Wyman, Arthur E.**, Sabattus, Me.; B.M.C., class of 1906; aged 70; died recently of injuries received when struck by an automobile.

BULLETIN

OF THE

SCHOOL OF MEDICINE

UNIVERSITY OF MARYLAND

Vol. 27

APRIL, 1943

No. 5

PATHOLOGIC CONDITIONS ENCOUNTERED IN HORSESHOE KIDNEYS*†

ALBERT E. GOLDSTEIN, M.D.

BALTIMORE, MD.

The anomalous condition known as horseshoe kidney has aroused considerable interest recently, particularly with regard to its treatment. Gutierrez (10) in his classical monograph on "The Clinical Management of Horseshoe Kidney" considered the horseshoe kidney essentially as a disease and differentiated it from diseases of the horseshoe kidney. Foley (7, 8) in his excellent discourses on the subject concluded that most of these cases deserve correction by symphysiotomy and nephropexy. Goldstein and Abeshouse (9) in a recent discussion of eight of their cases concluded that six of them presented definite renal pathologic changes. After a more careful review of the two other cases the author feels that these two presented symptoms referable to the kidney in the absence of definite pathologic changes.

A new classification was made by these authors and from this classification the treatment was outlined. Since it is not desirable to go into the details of the classification, the following outline is offered.

CLASSIFICATION OF GROUPS OF HORSESHOE KIDNEYS

- Group I. Cases of horseshoe kidney with or without symptoms referable to the kidney or related organs but with a definite pathologic renal lesion.
- Group II. Instances of horseshoe kidney with symptoms referable either to the kidney or other related organs in the absence of definite renal pathology.

* From the Department of Genito-Urinary Surgery, Sinai Hospital, and the Department of Pathology, School of Medicine, University of Maryland.

† Read before the Urologic Section of the American Medical Association, Atlantic City, N. J., June 8-12, 1942.

Group III. Cases of horseshoe kidney without symptoms referable either to the kidney or other related organs or tracts in the absence of renal pathology.

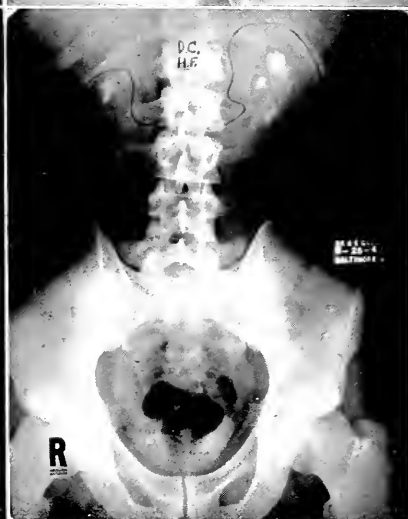
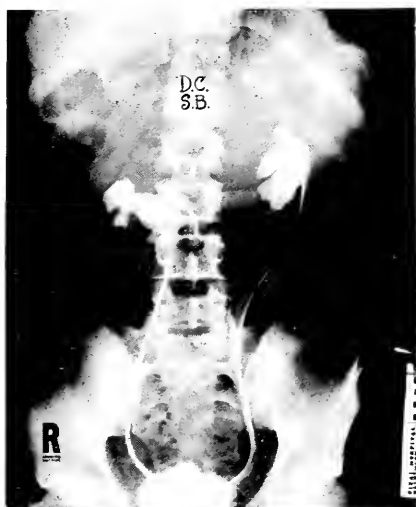


FIG. 1 (top). Case I. Stone in left section of horseshoe kidney.

FIG. 3 (bottom). Case III. Infected hydronephrosis, left section of horseshoe kidney.

FIG. 2 (top). Case II. Calculous pyonephrosis, left section of horseshoe kidney.

FIG. 4 (bottom). Case IV. Renal calculi, left section of horseshoe kidney.

It is in the third group that the anomalous condition is usually found accidentally in the course of a routine examination or at autopsy. The lesion has never given rise to any symptoms nor has it caused or become the seat of any pathologic process.

Horseshoe kidney in itself is described as an anomaly without an existing pathologic lesion. Peculiarly enough, in the description and examination of

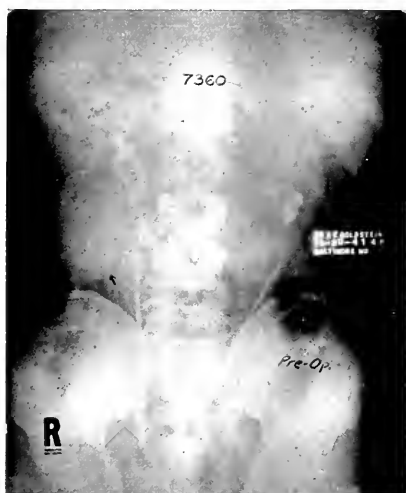


FIG. 5 (top). Case V. Renal neoplasm in right section of horseshoe kidney (pre-operative).

FIG. 7 (bottom). Case VI. Calcified cyst of right section of horseshoe kidney.

FIG. 6 (top). Postoperative heminephrectomy of right section of Case V, left section showing.

FIG. 8 (bottom). Left section of horseshoe kidney of Case VI.

most cases presenting symptoms as described by a great many authors, some renal pathologic process is discovered if a careful search is made.

It should be understood that the horseshoe kidney is a normal organ to the individual having such a kidney. Should a lesion develop in a horseshoe

kidney, then one is dealing with a disease of a horseshoe kidney and it should be treated the same as a disease of any normal kidney. That pathologic processes do occur in horseshoe kidneys is evidenced definitely by the various and extensive reports in the literature. In addition to the previously mentioned report by the author (9), it might be well to call to the attention of interested observers the following references. Renal calculi in horseshoe kidneys have been reported by Ray (19), Rindone (21), Priestley (18), Cacciatore (4), Placitelli (17), and Goldstein and Abeshouse (9). Tuberculosis in the anomalous organ has been listed and described by Rindone (21) and Verriere (25). Various types of tumors have been described in horseshoe

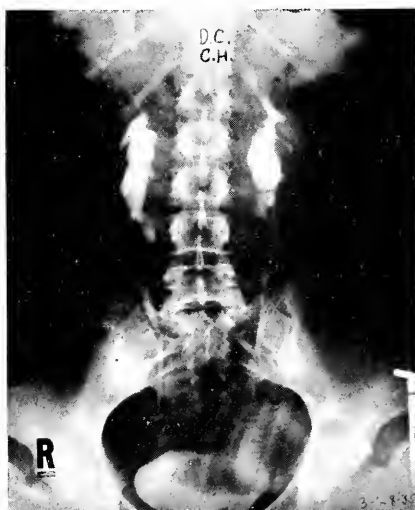


FIG. 9. Case VII. Horseshoe kidney without symptoms.



FIG. 10. Case VIII. Horseshoe kidney without symptoms.

kidneys by Nicholson (15), Perrier (16), Nicolich (14), Aspinall (1), Placitelli (17), Fitzgerald (6), and Goldstein and Abeshouse (9). It appears from the study of the literature that hydronephrosis, pyonephrosis, and pyelonephritis frequently affect the anomalous organ as reported by Sheer (22), Solis-Cohen (5), Cacciatore (4), Bumin (3), Braasch (23), and Goldstein and Abeshouse (9). Even the interesting lesion of polycystic degeneration in a horseshoe kidney has been discussed by Barbosa de Barros (2). Goldstein and Abeshouse (9) reported a case of calcified cyst of the kidney. Reynolds and Howard (20) described an unusual case of pelvic leukoplakia in a horseshoe kidney. Bilaterality of pathologic lesions in horseshoe kidneys has been reported by Solis-Cohen (5). Other anomalous conditions occurring in the anomalous horseshoe kidney have been reported by Liber (12), and Swick (24), and anomalous conditions in other parts of the body associated

with horseshoe kidneys have been listed by Krause (11), Word (26), and Meek (13).



FIG. 11. Case 10. Bilateral hydronephrosis. Autopsy.

In a previous report by Goldstein and Abeshouse eight cases of horseshoe kidney were discussed. Five additional cases of horseshoe kidney are here-

with presented. These are considered from a pathologic standpoint and therefore worthy of reporting. Ten of the thirteen cases showed a variable form of renal pathology, with or without symptoms. It is felt that a fair discussion is important, particularly with regard to their handling.

The thirteen cases observed were studied at the Sinai and the University hospitals. Nine of them were considered from a clinical standpoint and were diagnosed as such, while four cases were discovered at autopsy. In the latter four there were sufficient lesions present to warrant a tentative

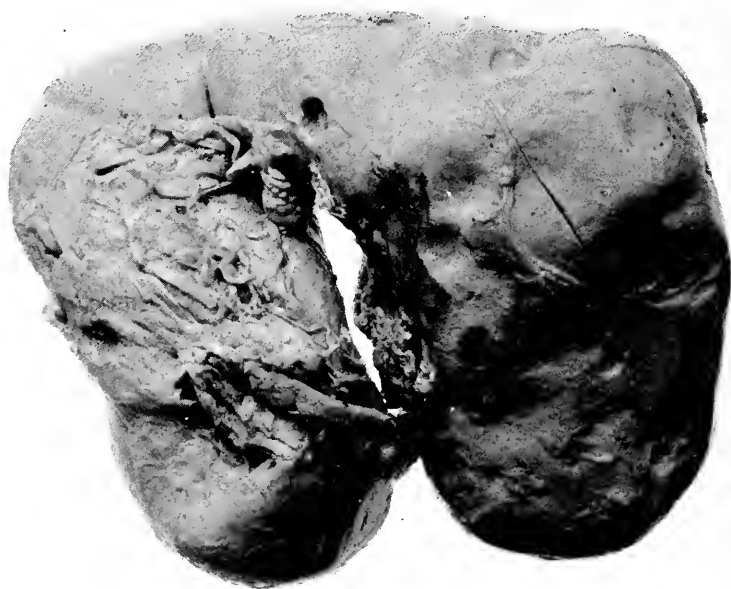


FIG. 12. Case XI. Cyst of left section of horseshoe kidney, upper fusion. Autopsy.

diagnosis, but the symptoms were so overshadowed by the productive symptoms of some other disease that little attention was paid to them.

A brief abstract of the thirteen cases is presented here.

ABSTRACTS OF CASES OF HORSESHOE KIDNEYS WITH A STUDY OF THEIR PATHOLOGY

1. S. B., age 35 years, male.

Complaint. Pain in the left side.

Past history. Symptoms of pain radiating in the left lumbar region, with nausea, vomiting, and diarrhea.

Examination of the blood and urine. Red and white blood cells found in the urine; leukocytosis.

Roentgen ray examination. Shadow in the left kidney pelvis, dilated left pelvis; calyces pointed medially on both sides; semicircular shadow below.

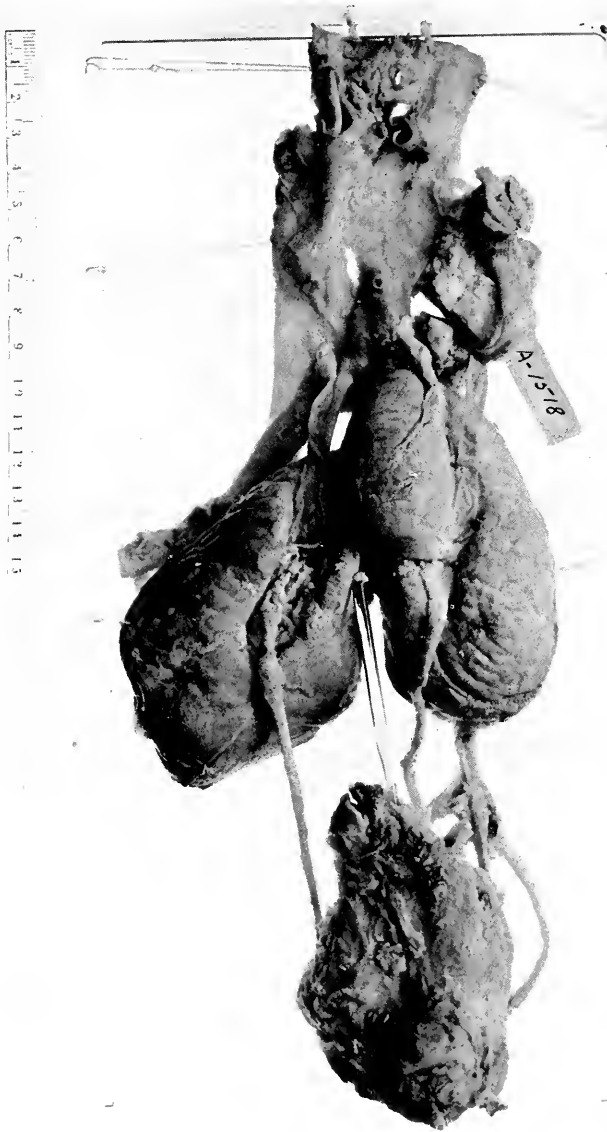


FIG. 13. Case XIII. Upper fusion of horseshoe kidney. Autopsy.

Diagnosis. Renal calculus, left, horseshoe kidney.

Operation. Pyelolithotomy, left.

2. A. H. L., age 25 years, male.

Complaint. Pain in the left lumbar region.

Past history. Nonradiating pain in the left loin, painless hematuria.

Examination of the urine. Few red and white blood cells.

Roentgen ray examination. Shadow in dilated pelvis of the left kidney; lower poles of kidneys pointed medially; calyces pointed medially and downward; semicircular shadow below.

Diagnosis. Renal calculus, left, horseshoe kidney.

Operation. Pyelolithotomy, left, and subsequent heminephrectomy.

3. L. C., age 77 years, female.

Admitted because of carcinoma of the sigmoid. During the course of examination it was found that she had an infected hydronephrosis, left, in a horseshoe kidney. An operation was not performed because of carcinomatosis.

4. M. F., age 31 years, male.

Complaint. Pain in the lumbar region.

Past history. Sharp pain in the left lumbar region, hematuria.

Examination. Palpable mass in the left side of the abdomen.

Examination of the urine. Red blood cells in the urine.

Roentgen ray examination. Three shadows in the left renal region; calyces in both kidneys pointed medially and downward; semicircular shadow below.

Diagnosis. Renal calculi, left, horseshoe kidney.

Operation. Pyelolithotomy, left.

5. H. S., age 53 years, male.

Complaint. General pains.

Past history. Right lower abdominal pains, radiating, and weakness.

Examination. Large mass in the right side of the abdomen verified by roentgenogram. Incomplete filling of dye in the right kidney, medial pointing of calyces on the left; semicircular shadow below.

Diagnosis. Renal neoplasm, right, horseshoe kidney.

Operation. Heminephrectomy, right.

6. P. L., age 57 years, female.

Complaint. Abdominal pain.

Past history. Periumbilical pain with nausea, vomiting, and diarrhea.

Examination. Palpable mass in the right side of the lower abdomen. Roentgenograph showed a calcified mass in the upper pole of the right kidney; semicircular shadow below; dilated pelvis on the right; calyces on both sides pointed medially.

Diagnosis. Calcified renal cyst, right, horseshoe kidney.

Operation. refused.

7. C. H., age 35 years, female.

Complaint. Vague pains.

Past history. Urinary frequency associated with additional symptoms referable to other tracts.

Examination. Revealed pathology in other parts of body, but ureteropyelography showed calyces pointing medially and semicircular shadow below. No lesions were found in the kidneys.

Diagnosis. Horseshoe kidney.

Operation. None advised.

8. H. E., age 36 years, female.

Complaint. Abdominal pain.

Past history. Pain in the right side of the abdomen and nausea. The appendix was removed but there was no relief from this pain.

Examination. Intravenous urography showed calyces pointing medially, with semi-circular shadow below.

Diagnosis. Horseshoe kidney.

Operation refused.

9. J. K., age 45 years, male.

Complaint. Vague symptoms.

Past history. Not feeling well, vague symptoms, no pain.

Examination. Routine intravenous pyelography showed calyces pointing medially.

Diagnosis. Horseshoe kidney.

Operation. None advised.

10. P. J., age 25 years, male.

Complaint. Abdominal pains.

Past history. Ill for months. There were some urinary symptoms, together with other symptoms.

Examination. No urography.

Diagnosis. Not made, patient died.

Autopsy. Revealed bilateral hydronephrosis in horseshoe kidney.

11. J. K., age 42 years, female.

Complaint. Abdominal pain.

Past history. Had pain for many years, with menstrual disturbances. A pelvic operation was performed with no improvement.

Examination. No urologic examination.

Diagnosis. Not made, patient died.

Autopsy. Revealed cyst of right section of horseshoe kidney, upper pole fusion.

12. H. J., age 52 years, female.

Complaint. Coughing.

Past history. Admitted to the hospital because of pneumonia.

Examination. No urologic examination.

Diagnosis. Not made.

Autopsy. Small cysts associated with diffuse nephritis in horseshoe kidney, lower pole fusion.

13. J. P., age 49 years, male.

Complaint. None relating to kidneys.

Past history. Ill for a long while before admission.

Examination. No urologic examination was made.

Diagnosis. Not made.

Autopsy. Horseshoe kidney, upper pole fusion.

Ten of the thirteen cases presented a definite renal pathologic lesion.

Renal calculi.....	3 cases
Hydronephrosis.....	2 cases

Pyonephrosis.....	2 cases
Renal neoplasm.....	1 case
Pyelonephritis.....	1 case
Cysts.....	3 cases
<i>a.</i> Calcified cyst.....	1 case
<i>b.</i> Cysts associated with chronic diffuse nephritis.....	1 case
<i>c.</i> Solitary cyst.....	1 case

Two of the above cases had more than one renal lesion.

Fusion. The fusion occurred in the upper pole in two cases or 15 per cent, and in the lower pole in eleven cases or 85 per cent. A pathologic process occurred in only one of the two cases where the fusion was in the upper pole. It appears from this study that the fusion played an important part in the production of lesions because an obstruction in the overlying ureter seems to have caused urinary stasis and the probable production of hydro-nephrosis, pyonephrosis, and renal calculi.

Sex. Seven of the cases occurred in males and six in females.

Age. In the ten cases in which a pathologic process was present the ages varied from twenty-four to seventy-seven years.

SYMPTOMS

In a careful analysis the symptoms produced by the pathologic processes were as follows:

Pain, lumbar.....	9 cases
Pain, abdominal.....	9 cases
Pain, periumbilical.....	3 cases
Nausea.....	4 cases
Vomiting.....	2 cases
Diarrhea.....	3 cases
Constipation.....	6 cases
Urinary symptoms.....	7 cases

All of the cases had a combination of two or more symptoms.

DIAGNOSIS

In all probability many cases of horseshoe kidney are undiagnosed in the presence of other pathologic lesions because, as mentioned, many of the productive symptoms are not necessarily related to the kidney and therefore a urologic study is not made. A diagnosis may be made from a plain roentgenograph in which a semilunar shadow is frequently seen, especially if the fusion occurs in the lower pole. It is also observed that the lower poles of the kidneys are closer to the vertebral column. Often the shadows of both kidneys are lower than normal. Finally, ureteropyelograms demonstrate a deviation of the ureters to the midline with some of the calyces pointing medially, downward, or both. Typical cases demonstrate

this picture bilaterally, although frequently one side will be more pronounced than the other. Occasionally one kidney is considerably lower than the other, or the pelvis and calyces are overlying the lumbar vertebrae and may be difficult to visualize. Various bizarre forms are observed in many instances. Stereoscopy is of tremendous value and if practiced one will observe in most instances that the pelvis and ureter are placed anteriorly rather than posteriorly. The lower pole of the kidney is frequently in close contact to the ureter. In some instances a diagnosis is not made until the time of autopsy or operation, when the abdomen may be opened because of a mass which proves to be retroperitoneal. In some instances of this kind such an error could have been avoided if a ureteropyelograph had been made. In this series the cases discovered at autopsy had not been studied from a urologic standpoint.

TREATMENT

In the treatment of this condition one is compelled to consider several important points which are as follows:

1. Are the presenting symptoms the result of the renal anomaly, or—
2. Are they caused by a lesion in the anomalous condition, or—
3. Are the symptoms the result of both?

If simply an anomalous renal organ is responsible for the symptoms without any definite lesion, it would seem logical to try to obtain as normal a condition as possible. To do this it would be necessary to make a division of the kidney and place each organ in its proper place. In other words, a symphysiotomy and bilateral or at least unilateral nephropexy should be performed.

If a definite pathologic condition is present then one necessarily assumes that the productive symptoms are caused by the pathologic condition. It therefore would be necessary to relieve the pathologic process as one would for a similar condition occurring in any kidney. Whether in addition to the correction of the lesion there should be further operative procedures, such as division of the kidney and nephropexy, depends entirely on the case in question. A symphysiotomy is more important than a nephropexy. In some of the cases reported the pathologic condition was simply treated. If the symptoms and signs that are present are the result of both the anomalous condition as well as the pathologic condition, then both should be corrected.

Finally, if the anomalous condition does not present any symptoms and if there is no indication of other pathologic conditions, a surgical operation should not be performed.

Ten of the cases reported presented a pathologic process. Eight of these ten should have been operated upon for the process, whereas two had insufficient renal lesions to warrant surgery.

Disposition of Cases with Renal Pathology

Operations performed.....	4 cases
Operations refused.....	2 cases
Operations neglected.....	2 cases
*Operations unnecessary.....	2 cases

Five operations were performed in four of these cases.

Surgical Operations

Pyelotomy.....	3 cases
Heminephrectomy.....	2 cases
Nephropexy.....	0 cases
Symphysiotomy.....	0 cases

One case required two operations.

RESULTS

Fortunately, or unfortunately, ten of the thirteen cases that are here reported presented some form of renal lesion, but only eight were of such a nature as to warrant surgical intervention. The other two cases presented insufficient lesions to warrant correction. Two of the three cases in which renal lesions were absent should have had surgical interference because of the severe symptoms. Four of these thirteen cases were discovered at autopsy and were not studied clinically, although nine were. All nine clinical cases were diagnosed as such. Of these nine, four submitted to surgery, four refused surgical intervention, and in one it was unnecessary. The four that agreed to surgery were subjected to five operations, one patient being operated upon twice. In this case a stone was removed in an effort to save the kidney, but subsequently the kidney had to be excised because of pyonephrosis. A heminephrectomy was performed. In the other three cases that submitted to surgery, one had a heminephrectomy for a hypernephroma in the right section of the horseshoe kidney, another had a pyelotomy done for a pelvic stone, and the third case had a pyelotomy for a pelvic stone. In this last case two calculi which were in the lower calyx were not obtained. Either a heminephrectomy or a symphysiotomy and partial resection of the kidney should have been performed in this instance. It has only been one year since this patient was treated and he has not complained of any symptoms since the operation. In the case where the pyelolithotomy was performed, a symphysiotomy or nephropexy was not done. It is now eight years since and the patient has not complained of any symptoms whatsoever. In the four cases where surgery should have been performed the patients are still having symptoms. In two the symp-

*These two cases presented insufficient renal lesions but had sufficient symptoms to warrant an operation.

toms are referable to the renal pathologic condition, and in the other two the anomalous condition is responsible for the symptoms.

CONCLUSIONS

1. Thirteen cases of horseshoe kidney are reported.
2. Ten cases present definite pathologic changes.
3. In eight of the ten cases, the renal pathology is responsible for the symptoms.
4. Four patients submitted to surgery. They were relieved of the symptoms and are living today.
5. Horseshoe kidneys are subjected to the same pathologic lesions as are other kidneys and should be treated as such.
6. Horseshoe kidneys in the absence of a pathologic process but with symptoms referable to the kidney should be subjected to symphysiotomy and if necessary to nephropexy.
7. Horseshoe kidney in itself, in the absence of a pathologic lesion as well as symptoms referable to the kidney should not be subjected to surgery.
8. Ureteropyelography should be practiced more frequently in cases of undetermined diagnosis, both general and urologic.
9. A new classification is suggested.

BIBLIOGRAPHY

- (1) ASPINALL, A.: Neoplasm of Horseshoe Kidney. Australian and New Zealand Jour. Surg., **8**: 408, April, 1939.
- (2) BARBOSA DE BARROS, J.: Horseshoe With Polycystic Kidney; Rare Case. Jour. de sif e urol., **10**: 139, May, 1939.
- (3) BUMIN, H.: Horseshoe Kidney: Case with Calculous Pyelonephritis Cured by Nephrectomy. Turk tib cem. mec., **5**: 48, 1939.
- (4) CACCIATORE, C., GALVEZ, I., AND PEREDA, J. J.: Horseshoe Kidney with Left Calculous Pyonephrosis; Recovery after Heminephrectomy; Case. Rev. Argent. de urol., **7**: 97, March-April, 1938.
- (5) COHEN, L. SOLIS AND BRUCK, S.: Horseshoe Kidney with Congenital Bilateral Hydronephrosis and Hydroureter; Roentgenologic Aspects. Pennsylvania Med. Jour., **37**: 819, July, 1934.
- (6) FITZGERALD, JOHN S.: A Case of Papillary Carcinoma in a Horseshoe Kidney. New York State Jour. Med., **41**: 1081, May, 1941.
- (7) FOLEY, F. E. B.: Operative Division of the Horseshoe Kidney. Minnesota Med. Jour., **18**: 176, March, 1935.
- (8) FOLEY, F. E. B.: Surgical Correction of Horseshoe Kidney. Jour. Am. Med. Assn., **115**: 945, 1940.
- (9) GOLDSTEIN, A. E. AND ABESHOUSE, B. S.: Surgical Treatment of Disease of Horseshoe Kidney. In publication.
- (10) GUTIERREZ, ROBERT: The Clinical Management of Horseshoe Kidney. Paul B. Hoeber, Inc., New York City, 1934.
- (11) KRAUSE, W.: Horseshoe Kidney; Case with Abnormality of Duodenum. Anat. Anz., **85**: 420, February, 1938.

- (12) LIBER, A. F.: Trilobate Horseshoe Kidney and Multiple Cardiopathies: Case. *Ann. d'anat. path.*, **11**: 95, January, 1934.
- (13) MEEK, J. R. AND WADSWORTH, G. H.: Horseshoe Kidney; Case Lying between Great Vessels. *Jour. Urol.*, **43**: 448, March, 1940.
- (14) NICOLICH, G.: Hypernephroma of Right Half of Horseshoe Kidney: Case. *Ztschr. f. Urol.*, **32**: 696, 1938.
- (15) NICHOLSON, W. V.: Squamous Cell Carcinoma of Renal Pelvis in Horseshoe Kidney. *Brit. Jour. Surg.*, **24**: 397, October, 1936.
- (16) PERRIER, M.: Carcinoma of Pelvis in Horseshoe Kidney; Case in Child. *J. belge d'urol.*, **9**: 357, October, 1936.
- (17) PLACITELLI, G.: Horseshoe Kidney; Two cases Complicated by Tumors and Case Complicated by Calculi. *Arch. ital. d. chir.*, **58**: 79, 1940.
- (18) PRIESTLEY, J. T. AND COOK, E. N.: Multiple Calculi in Horseshoe Kidney; Case with Many Interesting Features. *Proc. Staff Meeting of Mayo Clinic*, **11**: 355, May, 1936.
- (19) RAY, P. N.: Nephrolithiasis in Horseshoe Kidney. *Indian Med. Gaz.*, **69**: 9, January, 1934.
- (20) REYNOLDS, L. R. AND HOWARD, N. J.: Pelvic Leukoplakia in Horseshoe Kidney. *Jour. Urol.*, **30**: 653, December, 1933.
- (21) RINDONE, A.: Primary Calculous and Granulous Tuberculosis of Left Half of Horseshoe Kidney; Recovery of Case after Surgical Therapy. *Arch. ital. d. urol.*, **13**: 265, May, 1936.
- (22) SHEER, R.: Calculous Pyonephrosis in Horseshoe Kidney. *Ztschr. f. Urol.*, **28**: 203, 1934.
- (23) SHOEMAKER, R. AND BRAASCH, W. V.: Horseshoe, Fused Kidney; Description of Gross Pathologic Changes in 35 Cases. *Jour. Urol.*, **41**: 1, January, 1939.
- (24) SWICK, M.: Quadruple Kidney with Horseshoe Component Demonstrated with Aid of Excretory Urography. *Jour. Mt. Sinai Hosp.*, **4**: 7, May-June, 1937.
- (25) VERRIERE, P.: Tuberculosis in Horseshoe Kidney; Left Nephrectomy; Case. *Bull. Soc. franc. d'urol.*, pp. 230-234, June, 1938.
- (26) WORD, B.: Congenital Absence of Uterus and Vagina and Associated Ectopic Horseshoe Kidney. *Mississippi Doctor*, **16**: 13, September, 1938.

MASSIVE INTESTINAL HEMORRHAGE FROM MECKEL'S DIVERTICULUM*†‡

REPORT OF TWO CASES

MILTON S. SACKS, M.D.

BALTIMORE, MD.

The syndrome of massive intestinal hemorrhage from Meckel's diverticulum is one which has been the subject of periodic reports in medical literature, many of which have been accompanied by complete summaries of previously published cases. In spite of such summaries the syndrome is perhaps less well known than it deserves to be. It is apparently of more frequent occurrence than reference to standard texts would lead one to believe. Its clinical characteristics are extremely well defined and it lends itself to precise clinical diagnosis and therapy. The purpose of the author is not to review the accumulated data, but rather to call attention to the salient aspects of this clinical entity as exemplified in two typical cases.

CASE REPORTS

Case No. 1: C. K., a white, male, age 14 years, was admitted to the Bon Secours Hospital on November 14, 1942. During the preceding evening, without any previous symptoms or history of gastrointestinal disturbance, the patient passed a stool consisting almost entirely of dark red blood. During the remainder of the evening and in the early morning hours several additional similar stools were passed. He was admitted to the hospital with symptoms of shock and air hunger. On attempting to sit up in bed he fainted several times.

A review of the systems, past and family histories were noncontributory. The physical examination revealed marked pallor, tachypnea, tachycardia, and hypotension. An abdominal examination was negative. A rectal examination revealed no lesions, but on withdrawing the examining finger the glove was found to be covered with blood. Treatment for shock, consisting of transfusions of whole blood and plasma, was immediately instituted and the patient was kept under close observation. Laboratory studies revealed no significant data aside from demonstrating the presence of an acute hemorrhagic type of anemia. The patient was sigmoidoscoped but no additional information was obtained.

Late in the afternoon of November 14 he passed a large liquid stool measuring 800 cc. and consisting almost entirely of blood. Further transfusions were given. At 9:00 a.m. on November 15 a similar stool measuring 500 cc. was passed; and at about noon 750 cc. of similar material was passed. Repeated transfusions were given. The patient was taken

* From the Department of Clinical Pathology, School of Medicine, University of Maryland, and from the Department of Pathology, Bon Secours Hospital.

† Presented at the meeting of the Pathology Section of the Baltimore City Medical Society, March 15, 1943.

‡ Aided by a grant from the Sydney M. Cone Research Fund.

to the operating room, where an exploratory laparotomy was performed through a left lower paramedian abdominal incision. The site of hemorrhage could not be located. A colostomy was performed and a pack placed in the sigmoid colon extending to the rectum.

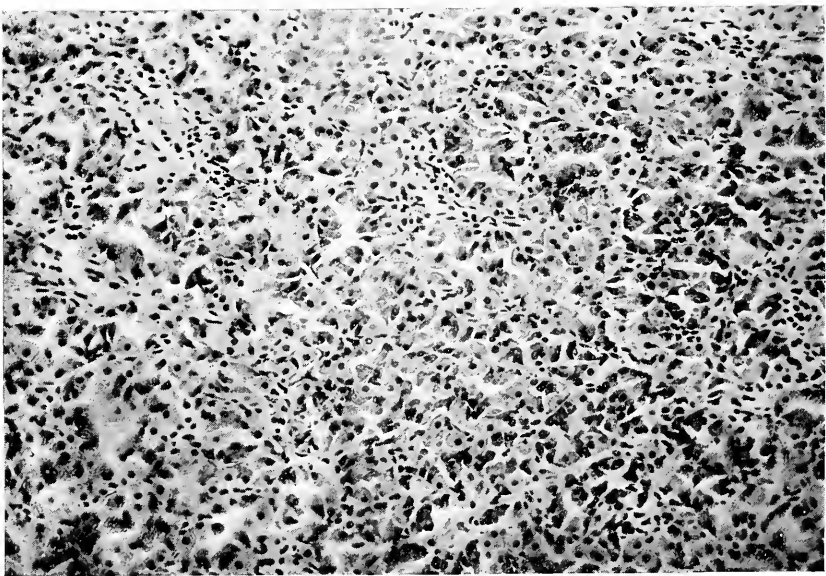


FIG. 1 (top). Diverticulum, Case No. 1. Mass of gastric mucosa can be seen at the apex.

FIG. 2 (bottom). A photomicrograph of the gastric mucosa of the diverticulum in Case No. 1. Typical gastric glandular epithelium is present.

Continued antishock therapy was given. The patient received a total of 3500 cc. of blood by transfusion between the time of admission and death at 2:00 a.m. on November 16, 1942. The total duration of illness was approximately fifty-four hours.

An autopsy limited to an examination of the abdominal cavity was permitted. The positive findings were: The entire colon was filled with dark red blood. This was likewise true of the ileum up to a point approximately thirty-six inches above the ileocecal valve. Thirty inches above the valve a diverticulum was found. This measured 3.5 cm. in diameter at its base and was 9 cm. long. Its tip was attached firmly to the posterior parietal peritoneal wall by a dense band of adhesions. It was filled with blood. An examination of the opened diverticulum (Fig. 1) revealed a polypoid mass of rugose tissue resembling gastric mucosa at its apex. A shallow ill-defined ulceration was noted in this area. No definite bleeding point could be detected. A histologic examination of this tissue revealed typical gastric mucosa of the fundal type (Fig. 2).

Case No 2: V. L., (University Hospital No. 54,923), a white male, 13 years old, was admitted to the hospital at 4:00 a.m. on September 2, 1942. At 9:00 p.m. the preceding evening he had a bowel movement which consisted mostly of bright red blood mixed with darker blood. Since no other symptoms occurred, the patient was put to bed and fell asleep. At about 1:00 a.m. he became extremely nauseated and vomited some grayish-green material. The patient again had a bowel movement which contained a great deal of blood. He went back to bed but continued to pass bright red blood through the rectum. At about this time, on attempting to get up, he fainted. A physician who saw him advised immediate hospitalization.

In reviewing the past history it was noted that the patient had an appendectomy performed in 1940. About a year later he had a series of attacks of abdominal pain which he said "doubled him up." These were similar to the episode of acute appendicitis and were thought to be caused by "adhesions." No previous rectal bleeding had occurred. The remainder of the history was noncontributory.

On admission to the hospital a physical examination revealed definite pallor but no evidences of shock. An abdominal examination was negative. A rectal examination resulted in the soiling of the glove with blood. No masses or hemorrhoids were noted.

The laboratory studies revealed only an acute hemorrhagic type of anemia. No additional information was gained by further clinical and laboratory examinations.

The patient was treated symptomatically with transfusions and steadily improved. Intestinal bleeding ceased. On September 15, 1942 a gastrointestinal roentgen ray series was done which disclosed slight dilatation of the terminal ileum, but no other pathologic change. A barium enema likewise failed to reveal any deviations from normal. Proctoscopic examinations carried out during his stay in the hospital were negative. The patient was discharged on September 18, 1942 as greatly improved.

On January 20, 1943, after an interval of three uneventful months, the patient was admitted to the Maryland General Hospital on the service of Dr. Frank C. Marino with the complaint of severe abdominal pain of six days' duration. He was vomiting profusely on admission and had not had a bowel movement for several days. During the prior three days he had been passing small amounts of blood rectally. An examination at this time showed a well-developed, well-nourished young white boy in acute distress. The examination was negative except for the abdomen. Here marked tenderness and some rigidity were noted in the right lower quadrant. No masses could be felt. Active peristaltic movements were heard on auscultation.

Surgical intervention was found necessary. At operation intussusception of the ileum was noted approximately four feet from the ileocecal valve. When reduced it was found to be caused by a Meckel's diverticulum which had invaginated the ileum. A diverticulectomy was performed and, because the lumen of the bowel appeared decidedly narrowed following this, a lateral anastomosis was done. The patient's postoperative course was uneventful and he was discharged on February 3, 1943.

Pathologic study of the surgical specimen by Dr. C. Wilbur Stewart showed a diverticu-

lum 3 cm. long and 3 cm. wide at its base. The mucosa appeared edematous and polypoid, and was covered by a mucoid exudate. A histologic examination showed the presence of gastric mucosa as well as evidence of a subacute inflammatory process throughout the wall of the specimen.

EMBRYOLOGIC AND ANATOMIC DATA

Meckel's diverticulum is a relatively common congenital anomaly of the gastrointestinal tract. It is estimated to occur in 1 to 3 per cent of all persons (1). The presence of such a diverticulum was first recorded by Lavater (2) in 1672, but it remained for Meckel (3) in 1809 and again in 1812 to describe it accurately, discuss its embryologic background, and emphasize its clinical importance. The diverticulum represents the persistence, as a patent appendage, of the proximal portion of the vitelline or omphalomesenteric duct which extends between the yolk sac and the primitive digestive tract. Normally, this duct is obliterated at the 7 mm. stage of embryonic development, or thirty-eighth day. Such failure to obliterate may occur not only proximally but also throughout its entire length, thus producing a fecal fistula at the umbilicus. The diverticulum may lie free within the abdomen or it may be attached by a congenital fibrous band to the abdominal wall or some other portion of the intestine. Its location varies somewhat. Hudson and Koplik (4) in a series of thirty-two cases found it from eight to forty inches above the ileocecal valve. In adults its usual position is approximately thirty-six inches from the valve. In infants, however, Fitz (5) found it more commonly twelve inches above the valve.

PATHOLOGY

Meckel's diverticulum may be the seat of a variety of pathologic processes common to other portions of the intestinal tract. However, the frequent occurrence of another congenital anomaly here is responsible for perhaps the most striking disease entity of the appendage. This abnormality is associated with the presence of heterotopic epithelium. The entoderm of the primitive digestive tube and the vitelline duct is multipotential. From it are derived all the varieties of gastrointestinal epithelium and glands. Because of unknown stimuli, heterotopia or the abnormal placement of epithelium may occur in many sites throughout the digestive tract. In Meckel's diverticulum the most important heterotopia is the occurrence of typical gastric mucosa. Other epithelial heterotopias occur here, such as the occasional presence of pancreatic tissue, duodenal glands, and even colonic mucosa.

Gastric mucosa was first noted in this location by Koch (6) in 1904, although Zenker (7) had reported the presence of pancreatic acini in 1861. Varying figures are given for the frequency of gastric heterotopia. Hudson

and Koplik (4) noted it in 67 per cent of their series of cases. Other reviews give a lower incidence (8, 9). An average figure of 13 per cent represents a conservative estimate. The heterotopia may be limited to one small area or it may be so widespread as to cover the mucosal surface of almost the entire diverticulum. The epithelium functions in a normal manner and produces both pepsin and hydrochloric acid. This fact has been confirmed by the findings in cases in which the duct opened at the umbilicus as a fistula. The occurrence of acid secretion is responsible for the development of mucosal ulceration, i.e., peptic ulceration. Such ulcers develop more commonly on adjacent diverticular or even ileal tissue rather than within the heterotopic mucosa. In this respect they are analogous to stomal jejunal ulcers that occur following gastroenterostomy. In the diverticulum they are more commonly located near the base rather than at the apex. Even in this site peptic ulcers are prone to complications such as occur in the stomach and duodenum, namely, hemorrhage and perforation.

CLINICAL CHARACTERISTICS

Peptic ulceration of Meckel's diverticulum is predominantly a disease of infancy and childhood. In a series of seventy-six cases collected from the literature by Matt and Timpone (10), 85 per cent occurred in persons under twenty years of age. In fact, 66.7 per cent were in children under ten years. Clinical signs may begin in the first few weeks of life as recorded by Moll (11) in citing the case of a patient two weeks old. The process is distinctly more common in males, with a reported predominance of three to one.

The cardinal symptom in these cases is intestinal hemorrhage. Bleeding is usually sudden in onset and massive in character. The common history is of the abrupt passage of a stool consisting almost entirely of whole blood. Since bleeding is usually brisk, the blood is but little changed in its passage through the lower bowel. It emerges perhaps a little darker than blood passed in the rectum, but seldom, if every, tarry in character. Scattered clots may be present, but no mucus is seen nor are there pus cells such as occur in the dysenteries. The bleeding may be so profuse as to lead to almost complete exsanguination with ensuing symptoms of hemorrhagic shock. Callendar (12) reported a case in which death occurred within thirty-six hours after onset in an infant of nineteen months. In many cases the bleeding ceases only to recur at some variable later interval.

Hemorrhage may be the only symptom, although abdominal pain is occasionally present. It is usually of vague character and is seldom well-localized. At times it may be centered about the umbilicus and may have a colicky, cramplike character. Abdominal tenderness and muscular rigidity are absent. With perforation, of course, all the classical signs of peritonitis occur. Such a catastrophe was noted in nineteen of thirty-four cases

of peptic ulceration collected by Greenwald and Steiner (13). Hemorrhage may occur simultaneously with perforation or may precede it by days or months.

COMMENT

Ulceration of heterotopic gastric mucosa in Meckel's diverticulum produces a well-defined clinical syndrome. A survey of the literature discloses the constancy of the symptoms. The salient features are: 1. Youthfulness of the patient, commonly male; 2. sudden onset of rather profuse hemorrhage per rectum; 3. usual absence of severe abdominal pain or evidence of peritoneal irritation. Clinical history and observation are perhaps the only reliable criteria for diagnosis. No pathognomonic adjunct aids exist. Should gastrointestinal roengen ray studies be attempted during the acute phase of the illness, in the vast majority of instances no helpful information would ensue. Meckel's diverticulum cannot be seen even by careful roentgenologic visualization of the ileum. Other examinations are of no avail. Precise diagnosis followed by prompt surgical intervention in the carefully prepared patient seems to be indicated. In a consideration of other causes of rectal hemorrhage in the young, differential diagnostic possibilities are always present. Among such entities may be mentioned intussusception, the dysenteries, Henoch's purpura, rectal polypi and, rarely, congenital, hereditary mucosal telangiectasis, or Osler-Weber's disease. It is beyond the scope of this paper to enter into any considerable detail concerning the differential features of each of these entities. It should be sufficient to say that in none of these diseases does such massive intestinal hemorrhage occur.

SUMMARY

1. Two cases of massive intestinal hemorrhage from ulceration of the heterotopic gastric mucosa in Meckel's diverticulum are reported.
2. The embryologic, pathologic, and clinical characteristics of the syndrome are reviewed.

Grateful acknowledgement is given to Doctors James Herbert Wilkerson, Thurston R. Adams, and Frank C. Marino for permission to use the clinical material presented in this paper.

BIBLIOGRAPHY

- (1) ABT, I. A. AND STRAUSS, A. A.: Meckel's Diverticulum as a Cause of Intestinal Hemorrhage. *Jour. Am. Med. Assn.*, **87**: 991, 1926.
- (2) LAVATER, quoted by KERN, T.: *Ueber die Divertikel des Darmkanals*, Inaug. Diss., Tubingen, 1874 (from Morgagni).

- (3) MECKEL, J. F.: Ruil und Autentreiths, *Arch. f. d. ges. Physiol.*, **9**: 428, 1809, quoted by FITZ, H. R.: Persistent Omphalo-Mesenteric Remains; Their Importance in the Causation of Intestinal Duplication, Cyst Formation and Obstruction. *Am. Jour. Med. Sc.*, **88**: 30, 1884; *Handbuch der pathologischen des Menschen-Anges*, **1**: 553. Hamburg, 1812.
- (4) HUDSON, H. W. JR. and KOPLIK, L. H.: Meckel's Diverticulum in Children: Clinical and Pathologic Study, with Report of 32 Cases. *New England Jour. Med.*, **206**: 827, 1932.
- (5) FITZ, H. R.: See reference No. 3.
- (6) KOCH, M. in discussion of BUSCH: Festschrift gewidmet den Teilnehmern der 84. Versammlung Deutscher Naturforscher und Ärzte in Munster in Westf. von der Medizinisch—naturwissenschaft lichen Gesellschaft in Munster, p. 28. F. COPPENRATH, MUNSTER, 1912.
- (7) ZENKER, F. A.: Neben Pancreas in der Darmwand. *Virchow's Arch. f. path. Anat. u. Physiol.*, **21**: 369, 1861.
- (8) SCHAEZT, G.: Beitrage zur Morphologie des Meckel'schen Divertikels. *Beitr. z. path. Anat. u. z. allg. Path.*, **74**: 115, 1925.
- (9) CURD, H. H.: A Histologic Study of Meckel's Diverticulum: with Special Reference to Heterotopic Tissue. *Arch. Surg.*, **32**: 506, 1936.
- (10) MATT, J. G. AND TIMPONE, P. J.: Peptic Ulcer of Meckel's Diverticulum: Case Report and Review of Literature. *Am. Jour. Surg.*, **47**: 612, 1940.
- (11) MOLL, H. H.: Giant Meckel's Diverticulum. *Brit. Jour. Surg.*, **14**: 176, 1926.
- (12) CALLENDAR, G. R.: Gastric Glands in Meckel's Diverticulum. *Am. Jour. Med. Sc.*, **150**: 69, 1915.
- (13) GREENWALD, A. M. AND STEINER, M.: Meckel's Diverticulum in Infancy and Childhood. *Am. Jour. Dis. Child.*, **42**: 1176, 1931.

1941 ANNUAL REPORT OF THE DEPARTMENT OF OBSTETRICS, SCHOOL OF MEDICINE, UNIVERSITY OF MARYLAND*†

LOUIS H. DOUGLASS, M.D.

BALTIMORE, MD.

FOREWORD

During the year 1941 the work of the Clinic of Obstetrics of the School of Medicine, University of Maryland increased appreciably, both in the number of patients cared for in the homes and those admitted to the hospital. Including abortions, the total number was 2059 in 1938, 2107 in 1939, 2400 in 1940, and 2650 in 1941.

The fetal mortality remains high; in fact, the 1941 rate is slightly higher than in 1939 and 1940, though somewhat lower than in 1938. In explanation of this mortality, it would appear that this Clinic is somewhat more liberal in its definition of a premature birth in contrast to an abortion than are some clinics, and about one-half of the fetal mortality was in this group.

The maternal mortality figure of 3.9 per 1000 is definitely higher than that of 2.0 for the City of Baltimore as a whole. However, two facts must be considered: first, the Clinic accepts a large amount of pathologic cases from the city and surrounding counties and one-third of the maternal deaths were in this group; second, there has been included every death occurring on the service, whether it was judged to be maternal or nonmaternal, whereas only the former are considered in the statistics of the City Health Department.

With the expected increase in the birth rate for the coming year, with no increase in hospital facilities, and a definite decrease in the number of doctors and nurses available, it may be expected that both the maternal and fetal mortality rates will be higher in 1942.

The efforts, interest and cooperation of the visiting and house staffs have been of the highest order, and are, of course, entirely responsible for whatever results have been obtained. Wholehearted thanks go out to this group from the Department of Obstetrics.

Total number of patients delivered (twins 32 sets—triplets 1 set) (not including abortions).....	2556
Delivered in homes (twins 5½ sets).....	1130—44.17%
White.....	142
Colored.....	988
Registered.....	1026
Unregistered.....	104

* From the Department of Obstetrics, School of Medicine, University of Maryland.

† Received for publication February 1, 1943.

Delivered in hospital (twins 26½ sets—triplets 1 set)	1427—55.82%
White	1084
Colored	343
Note—One patient with twins was delivered of the first baby at home and the second at the hospital.	
Total number of deliveries (1 set of twins delivered by section)	2589
White	1244
Colored	1345
Normal spontaneous	1507—58.20%
White	366
Colored	1141
Operative deliveries (all in hospital)	1082—41.79%
White	879
Colored	203
Forceps deliveries	946—36.54%
White	783
Colored	163
High	2
Occiput transverse-forceps rotation	1
Following external version of transverse presentation	1
Mid	20
Presentation, occiput posterior	7
Delivered as such	4
Delivered following rotation	3
Manual rotation	1
Scanzoni maneuver	2
Presentation, occiput transverse	4
Forceps rotation	1
Manual rotation	3
Second twin	3
Cord, prolapse of—Presentation transverse forceps, rotation of	1
Dystocia, cervical—inertia, uterine	1
Inertia, uterine	1
Distress, fetal—arrest, transverse, manual rotation	1
Second stage—prolonged	2
Low	924
Control	594
Presentation, occiput posterior	80
Delivered as such	36
Delivered following rotation	44
Spontaneous	5
Manual	25
Scanzoni	14
Presentation, occiput transverse	73
Spontaneous rotation	1
Manual rotation	35
Forceps rotation	37
Presentation, face—chin, anterior	2

Toxemia	104
Distress, maternal and fetal	2
Placenta, premature separation of, normally implanted	3
Placenta, premature separation of, low implanted	4
Placenta, previa marginalis	1
Labor, prolonged	37
Labor, premature	12
Rheumatic cardiovascular disease	3
Tuberculosis, pulmonary	2
Cord, prolapse of	2
Atelectasis, massive	1
Pregnancy, multiple	1
Pelvis, outlet contraction of	1
Section, previous	2
Breech extraction	75—2.89%
White	54
Colored	21
Internal podalic version and breech extraction	9—0.34%
White	5
Colored	4
Presentation, transverse	4
Presentation, compound	2
Presentation, face-chin, posterior	1
Second twin	2
Cesarean section	51—1.99%
White	36
Colored	15
Classical	11
Section, previous	1
Disproportion, cephalopelvic	1
Tuberculosis, pulmonary	1
Preeclampsia, fulminating	1
Uterus, threatened rupture of	2
Placenta, abruptio	1
Placenta, previa centralis	4
Laparotrachelotomy	37
Disproportion, cephalopelvic	12
Pelvis, contraction of	1
Disproportion, cephalopelvic, previous section	2
Placenta, previa partialis	2
Placenta, previa centralis	5
Preeclampsia, with twins	1
Placenta, abruptio	3
Vagino-cervical adhesions	1
Preeclampsia	3
Hypertensive disease	1
Pelvis, funnel	1
Section, previous	1
Section, previous, with breech	1
Renal disease, partial premature separation of placenta, with breech	1

Rectal stricture, previous section, contracted pelvis.	1
Delivery, previous—difficult with stillbirth and obesity. . .	1
Porro.	2
Abruptio placenta, with Couvelaire uterus.	1
Disproportion, cephalopelvic with infection, intrapartum .	1
Post mortem.	1
Death from cerebral hemorrhage.	1
Laparotomy.	1
White.	1
Colored.	0
Hysterectomy, supravaginal.	1
Uterus, rupture of.	1
Abortions.	94
Spontaneous.	93
In homes.	61
Registered.	26
Syphilis, maternal.	2
Cause undetermined.	23
Missed.	1
Unregistered.	35
Syphilis, maternal.	3
Cause undetermined.	32
In hospital.	32
Cause undetermined.	24
Twins.	1
Renal disease.	1
Following laparotomy.	1
Syphilis, maternal.	3
Syphilis, maternal and diabetes.	1
Missed.	1
Therapeutic.	1
Preeclampsia, fulminating.	1
Other operations and procedures not including delivery.	1659
Episiotomy.	957
Central.	915
Paramedian.	41
Bilateral.	1
Perineorrhaphy.	175
Indicated.	133
Elective.	42
Trachelorrhaphy.	122
Indicated.	41
Elective.	81
Sterilization.	51
Pomeroy.	51
Amniorhexis for induction of labor.	55
Hysterostomy.	16
Proctoperineorrhaphy.	66
Head, manual rotation of.	60

Head, forceps rotation of	58
Vaginal laceration, repair of	40
Vulval laceration, repair of	1
Placenta, manual removal of	7
Hematoma of labium, incision of	1
Uterus, manual exploration of	3
Willet clamp, application of	14
Adhesions, freeing of	3
Wound, secondary closure of	1
Fillet, application of	4
Hemorrhoidectomy	4
Version, external	4
Salpingo-oophorectomy	2
Spanish windlass, application of	1
Colporrhaphy, anterior and posterior	8
Dilatation and curettage	3
Cyst, vaginal, excision of	2
Polyp, cervical, removal of	1
Number of patients admitted to the hospital	1638
From prenatal clinic	701—42.79%
White	349
Colored	352
From other sources	937
White	893
Colored	44
Unregistered clinic patients	162—9.89%
Number of patients transferred	9
Medicine	6
Pneumonia	1
Pleuritis, fibrous	1
Septicemia	1
Leukemia, acute myeloid	1
Infarct, pulmonary	1
Lymphangitis, breast	1
Surgery	2
Obstruction, intestinal	1
Appendicitis, acute	1
Gynecology	1
Fibroid, degeneration of	1
Number of patients discharged	1646
Number of patients delivered for other services	0
Number of viable babies	2590
In homes	1135
White	144
Colored	991
In hospital	1455
White	1101
Colored	354

Full term living.....	2394—92.43%
In homes.....	1072
White.....	139
Colored.....	933
In hospital.....	1322
White.....	1021
Colored.....	301
Full term dead.....	51—1.96%
In homes.....	23
White.....	1
Cause unknown.....	1
Colored.....	22
In hospital.....	28
White.....	14
Colored.....	14
Premature living.....	122—4.71%
In homes.....	35
White.....	2
Colored.....	33
In hospital.....	87
White.....	51
Colored.....	36
Premature dead.....	23—0.88%
In homes.....	6
White.....	2
Colored.....	4
In hospital.....	17
White.....	10
Colored.....	7
Deaths in live born babies.....	65—2.58%
In homes.....	12
White.....	0
Colored.....	12
Prematurity.....	7
Hemorrhage, intracranial.....	1
Atelectasis.....	1
Anomalies, congenital, of gastrointestinal tract.....	1
Asphyxia caused by aspiration.....	1
Cause unknown.....	1
In hospital.....	53
White.....	34
Prematurity.....	17
Pneumonia, bronchial.....	1
Hemorrhage, intracranial.....	2
Septicemia, pneumococcic.....	1
Hemorrhage, intracranial with congenital anomalies.....	1

Heart disease, congenital	1
Hemorrhage, intracranial and prematurity	1
Asphyxia, resulting from aspiration	1
Anomalies, congenital, multiple of gastrointestinal tract	1
Atelectasis	2
Obstruction, intestinal	1
Diarrhea	4
Diaphragm left, abscess of and atelectasis	1
Colored	19
Prematurity	9
Cachexia—dehydration—abscess, breast	1
Hemorrhage, intracranial	1
Hypoglycemia—dehydration	1
Hemorrhage, intracranial and prematurity	1
Diarrhea	3
Prematurity and congenital syphilis	2
Atelectasis with cardiac dilatation	1
Total fetal mortality	139—5.57%
In homes	41
In hospital	98
Total maternal mortality	10—0.391%
In homes	2
In hospital	8
White	3
Encephalitis hemorrhagic, caused by arsphenamine	1
Hemorrhage, cerebral	1
Hemorrhage, subarachnoid	1
Colored	7
Tuberculosis, pulmonary	1
Thrombophlebitis, pelvic abscess, lung abscess and empyema	1
Anesthesia?—cerebral embolus?	1
Leukemia, acute myeloid	1
Eclampsia with cardiac failure	1
Edema, pulmonary as a result of cardiac failure	1
Uterus, rupture of	1
Deaths in registered clinic patients	6—0.855%
Deaths in unregistered clinic patients	3—1.851%
Deaths in private patients	1—0.129%
Number of serologic tests for syphilis in clinic patients	1731
White	470
Colored	1261
Number of positive results in clinic patients	249—14.38%
White	7—1.48%
Colored	242—19.19%
Number of positive results treated in clinic patients	244
White	7

Full term alive.....	5
28 weeks premature alive.....	1
32 weeks premature alive.....	1
Colored 237	
Full term alive.....	216
Full term dead.....	6
Undelivered.....	2
38 weeks premature alive.....	1
36 weeks premature alive.....	3
34 weeks premature alive.....	2
30 weeks premature alive.....	3
28 weeks premature alive.....	1
27 weeks abortion.....	1
20 weeks abortion.....	2
Number of positive results in clinic patients not treated.....	5
White.....	0
Colored.....	5
Full term dead.....	3
Full term alive.....	2
Number of clinic patients without serologic tests for syphilis.....	0

MATERNAL MORTALITY COVERING FOUR YEAR PERIOD

	1938	1939	1940	1941
Pregnancy, abdominal.....	1			
Abruptio placentae.....	2	1	1	
Shock, intrapartum (without hemorrhage)...	1			
Embolus, pulmonary.....	1			
Infection, puerperal.....	1		2	1
Uremia.....	1			
Reaction, transfusion.....	1			
Anesthetic.....	1	1	2	
Heart disease, rheumatic-decompensation....	1		1	
Liver, acute yellow atrophy of.....		1		
Cardiovascular collapse.....		1	1	1
Cardiac dilation.....		1	1	
Uterus, rupture of.....		1	1	1
Hemorrhage, intracranial.....			1	2
Arsphenamine encephalitis.....				1
Tuberculosis, pulmonary.....				1
Embolus, cerebral.....				1
Leukemia, acute myeloid.....				1
Eclampsia (ante and intrapartum).....				1
Total..... 36	10	6	10	10

Rate per 1000 patients, 3.9.

VARICOSE VEINS: A SAFETY CABINET FOR THEIR INJECTION*†

O. C. BRANTIGAN, M.D.

BALTIMORE, MD.

The ligation and injection, as well as the injection method alone, are established treatments for varicose veins and are used extensively by both specialists and general practitioners.

The voluminous literature upon the subject discusses the merits of three positions of the patient commonly used during the actual introduction of the sclerosing fluid into the varicose vein. The supine (1) or horizontal position has its adherents but it offers the difficulty of introducing the needle since in this position the veins are empty of blood. When the patient sits on a table or chair, the veins on the posterior aspect of the leg or thigh are inaccessible to the operator. The standing position is used most widely because the veins are distended with blood and the needle is easily introduced (3). When the patient stands on the floor the operator is at a disadvantage if not in an impossible position for introducing the needle into a vein in the leg. To overcome this difficulty it has been recommended that the patient stand on a chair or table (2), and in some large clinics the patients stand on a platform raised well above the level of the operator.

It is interesting to note that no previous comment has been made in the literature concerning the danger of a patient fainting during a treatment while standing on a table or chair. It is timely, therefore, that this danger be recognized. Patients sometimes faint from the mere insertion of a needle into a vein and should this occur while standing on a chair, table or platform serious injury might result. The operator must be constantly on guard against such a mishap and thus is often distracted from the important task of injecting the sclerosing solution into the vein. When standing on a table or chair the patient usually feels insecure.

In order to eliminate the danger of injuries from falling and to afford a sense of security to the patient and operator a simple cabinet or platform was constructed (Fig. 1). By the use of detachable stairs the patient ascends to a platform two feet above the floor. When the securely mounted door is locked the patient is entirely enclosed in a cabinet, except for a twenty-six inch opening on one side through which the examination and injection of the varicose veins are done. The enclosure is twenty inches square and this allows enough room for the patient to move and turn in the desired position but will not permit him to fall should he faint. He can only slump into the cabinet. The cabinet is mounted on casters for mobility.

* From the Department of Surgery, School of Medicine, University of Maryland.

† Received for publication February 23, 1943.

This safety cabinet has been employed by the author for some time and has been highly satisfactory. Patients whose treatment began before its use



FIG. 1. A photograph of a patient in the safety cabinet while a varicose vein is being injected with sclerosing fluid. The steps have been removed. The operator sits comfortably on a stool. The patient is afforded support and with it a sense of security. If the patient should faint he cannot fall.

In the upper insert a patient is seen ascending the removable stairs to enter the safety cabinet. The stairs are hooked to the cabinet on either side to prevent them from slipping. The middle insert shows the dimensions of the cabinet.

The lower insert illustrates the ease and comfort afforded the operator while injecting a varicose vein.

commented most favorably on the sense of security they felt while being treated in the cabinet.

CONCLUSION

A safety cabinet for the injection of varicose veins is described which eliminates the fear of injury subsequent to fainting during varicose vein injection. It gives the patient a sense of security and relieves the anxiety of the operator.

BIBLIOGRAPHY

- (1) BRUNSTEIN, I. A.: Prevention of Discomfort and Disability in the Treatment of Varicose Veins. *Am. Jour. Surg.*, **54**: 362, 1941.
- (2) RIDDLE, P.: Injection Treatment, Chap. 15, p. 127. W. B. Saunders Co., Philadelphia, 1940.
- (3) WATSON, G. B.: A Report on Eleven Years' Experience in the Treatment of Varicosities and Sequelae of the Lower Extremities. *Ohio State Medical Journal*, March, 1941.

SO HELP ME GOD*

MAJOR LOUIS A. M. KRAUSE, M.C., A.U.S.†

I am acutely aware of the responsibility as well as the privilege of addressing you on this occasion and at this time in the history of each of you and of Maryland and the world. In 1938 I addressed our graduating class in medicine. The world was then in the last days of an uneasy peace; today our world is convulsed and suffering a logical judgment on the shortcomings and repeated failures of the people in it.

In addressing you I cannot offer material things, nor would I if I could. I can only give you the picture of our needs and requirements as I see them at this time, and the sense and hope that along paths of mutual understanding and good faith we can find our places in the scheme of things and properly justify our existences.

You need but look about you in any direction to see the collapse of our material culture and so-called civilization. I would not be true to my beliefs if I offered you anything but the real verities of life, namely, the fruits that derive from the exercise and development of the spirit.

It may seem strange, yet should not be, to hear this from a member of the fighting forces of our nation. Inasmuch as you are soon to take your place in the Armed Forces, consider the implications of our part in the upheaval. It may surprise you somewhat from certain points of view, as it did me, when I first signed the Army oath, to see it concluded with the title of this address: "So Help Me God." I wonder if the idea of war is at all acceptable to God—God whom the prophets and leaders of all the great religions conceive as the fountainhead of righteousness and justice in human behavior.

In terms of this concept of God the world about us has so far failed to live up to Godlike standards; we see why wars occur. The search for the material things alone has failed to develop a dependable foundation for living or true progress in the ultimate business of humanity. I wish to urge you to fulfill that oath properly and to begin to apply the necessary principles of right thinking and living.

Is not this global war an evidence of the decay and degeneration brought about by the false values of material things and material culture we have insisted on having these latter times? Have not the nations moved too

* Address delivered at the Commencement Exercises of the University of Maryland School of Medicine and College of Physicians and Surgeons, and the University of Maryland School of Nursing. The Lyric, Baltimore, March, 25, 1943.

† Medical Service, Walter Reed General Hospital, Washington, D. C. and Associate Professor of Medicine, School of Medicine, University of Maryland.

rapidly in mechanical progress without neighbors learning how to live with each other? And remember the great omission and fallacy of our times—isolationism—that selfish uncomprehending belief that we could possibly go along serenely, contentedly, and prosperously regardless of what might be happening to our neighbors. Had we remembered the old teaching that it is more blessed to give than to receive, and had we learned to do with less and to want less, and had we reasoned properly that stability could be extended by sharing, our strong hand of hope and reason and guidance would have gone far to lift the world out of the slough of desperate hating which has all but engulfed it. The modern world of decreasing distances, of almost immediate communication, of easier transportation and travel, of possibilities for unlimited production and distribution has more than enough to provide for all mankind in due course. May we now, before it is too late, as citizens of our great country lead in learning to live in this world.

When you get into the services you will have a great opportunity for the exercise of your talents. Do not forget that the best book for the study of man is man himself. The war, like a laboratory, creates such environment for study, however largely artificial. You will often hear that in the armed service you are first a soldier and then a doctor. During my observations in the last war and so far in this one, I have found that the medical man who practices the best medicine proves the best soldier. As a physician, sacrifice and duty will not have to be taught you. Deadly contagious diseases hold no fear for you and long hours and hard duty have always been your lot. Who possesses better the virtues and qualities of the soldier and in addition those humanities not usually associated with the military than the physician?

You should practice the best medicine possible because your goal is getting the soldier well as quickly as possible and preventing illness. It is distressing to see poor medicine practiced, diagnoses not made because physical examinations at times are not completely done; the correct diagnosis not made because of failure to read the recent literature and be acquainted with new trends. Such failures and deficiencies make a poor soldier-doctor. Your responsibilities to the soldier who is your patient are the same as to your patient in civil life. Quitting time, which is frequently according to schedule in the Army, will not affect the good doctor. His duty to those in his care never stops. He must always keep his personal life and pleasures in restraint and himself ready for service. He is not like some defense workers who can only work forty hours a week at a much unearned wage per hour and then demand twice for overtime because of the surrender of some dubious leisure, or the employer who must have a surfeit of profit to be interested at all.

And speaking of dubious leisure, remember even excessive hard work rarely does as much harm as the abuse of leisure or failure to properly use leisure. You will have much time for thought and meditation during the next few years, whether you are in the Army or not. So with at least a few great books, the Bible, of necessity, make the most of your time when not working. I say the Bible, of necessity, because there, among many other things, you will find the basic eternal truths that confront all men, the story of the ethical development of morals and religion, the essence of the thoughts and enduring needs which are the endowment of freedom, and the foundation of all the charters of human hope and progress which have ever been or will ever be drawn. Government guaranteed security is unnecessary and wrong, and, incidentally, so are government controlled medical schools. We want guaranteed opportunity.

I wish I could get all of you to know the prophets, from Samuel to Paul, and particularly such men as Isaiah, Jeremiah, Hosea, Amos, and Christ, whom I visualize as living practical men, the forward lookers of their times, whose formula daily applied would solve all our problems. "And as ye would that men should do to you, do ye also to them likewise." This formula is the essence of our conception of God. Would that we had such articulate giants to influence our postwar world and to help us win and keep the peace! Yes, I know there is some selfishness in loving your neighbor as yourself, but how long do you think the peace will last if the terms and future provisions are made by our politicians and the men of arms and the diplomats? It truly will again be an armistice, not a lasting peace. Let us hope that the spirit of the prophets may walk abroad in the world soon, so that when that peace day comes, and may it be soon, we can say with Jeremiah that no more will the fathers have eaten sour grapes and the children's teeth set on edge, that no more will we sow the seeds for future wars.

Would that the nations would follow the lofty precepts of the Old Testament and the New Testament, teaching release and help for the many in colonial bondage. How much does the modern world need prophets with courage and righteous candor! We need more Ghandis. There is much room and need for improvement everywhere. You will see all your lives the many social injustices that exist. Man's inhumanity to man is an old story but it must be eliminated. The degradation and pain of social injustice are greater than physical pain. Just think of the many peoples in the world who are considered spoil by those stronger, the downtrodden poor in so many places and lands, those still living in or being thrown into miserable serfdom. Not only in our western world; think of the poor and oppressed black backs and brown backs that have been and are bearing the white man's burden. Just now in our social fabric we complain bitterly

about the lack of tires and gasoline for automobiles. Yet we have all been guilty of riding cheaply as the result of the toil, sweat, and blood of the economic slaves on the rubber plantation.

The tide of the lowly and the common man must rise. In the belief of our religious concepts and in the realization of the equilibrium possible with the sharing of life and opportunity, we must extend the hand of help and friendship to the peoples of the world less fortunate than ourselves. A few missions, however noble in purpose, are not enough. Let us curb the greed of the business men at home and abroad, American and otherwise. Thank God our own great country has led the world in the treatment of its colonies, and as a result we witnessed the great and heartening loyalty of the Philippines.

We must take a broader and healthier view of the world of nations. We must be willing to accept our responsibility as a nation and act on the problems of the world even though our national interests are not directly involved. Just as an epidemic anywhere in the world is very much of our business and concern, so we must recognize that a disturbance of the peace anywhere in the world is a disturbance to the peace of the whole world. Let something happen to one organ of the body and the whole will suffer. Peace is never national unless it is international.

After a varying length of time in the Army service you will wish to return to the greater and happier side of the practice of medicine. For some time you will have felt, more or less regularly, the urge to get home. During a war, probably the underlying, subconscious or even conscious, desire for protection and security causes the most acute pangs of homesickness. Children, old people and ill people particularly are always subject to the greatest yearning for home. It is the home that expresses the basic strength and security of the family. Likewise, the happiness and security of the home are emblems of the strength and elasticity of the nation.

In civil practice you will deal with the patient and his home. I hope that we lose enough of the material trappings of our age so that we learn again to appreciate the home as the fountain of all spiritual values. And by home I mean the place where the stress is placed upon the simple virtues of decency, honesty, and work, where children are taught self restraint and application, and the cardinal virtue of not wanting too much, and wherein children are not given over to the silly ideas of complete individualism and self expression that many of our psychologists and psychiatrists so blithely proclaim.

I would suggest that each of you do general practice for a few years before attempting to specialize. One of our greatest needs in medicine is for well-trained general practitioners. These are the bulwark of medical service to the public; further, more general practice properly provides the background for the assumption of the right to practice a specialty.

It stands to reason that by virtue of the time, effort, and expense involved a man or woman who studies medicine today must naturally be attracted to the field. He must love and enjoy his work to such an extent that he becomes one of those rare fortunate, privileged human beings who have both vocation and avocation in the one effort. As such you are greatly to be congratulated. Some of you will go into general medicine, some into specialties in the course of time, some will go into research, but the general picture of responsibility is common to all those who enter the field.

In our economy the physician, with reasonable application, is generally able after a short while to earn a livelihood rather considerably above the average level and usually commensurate with the preparation and responsibility involved. Yet the pursuit of wealth and material gain per se, it should be borne in mind, is hardly in keeping with the high calling and sincere responsibility of the medical profession generally. Beyond practical approach to livelihood and reasonable security, the making of money in ordinary terms of success should not be a part of the picture.

In the practice of medicine the physician combines scientific approach and achievement with the highest traditions of human understanding and psychology. In the intimate contact with the patient's fears, anxieties, and forebodings the physician's outlook and approach are like those of the minister or priest. So often does the patient struggling with mental and physical maladjustments open the recesses of his mind only to the physician. It is along these lines that lie the most important bases of success for the physician, the achievement and restoration of health and proper function to those sick in body and mind. It is difficult to estimate at what point medicine ends and the application of faith begins; more likely the two are never separate. But it is along these avenues that the properly oriented doctor will derive the greatest happiness from his work.

The young doctor, having completed his formal schooling, should continue to study. With all that is going on in medicine a constant devotion to the cause of more and better knowledge is necessary to remain reasonably abreast of trends. Medicine and the related sciences are making such great forward strides that the whole picture is one of flux. New concepts and approaches, including the many developing in the background of the war, challenge the imagination. The physician, eager for knowledge, will not let his curiosity falter, regardless of the demands on his time.

It is the constant surge forward of medicine to new achievements and higher standards that gives the physician his just pride and dignity in his work. Maintain an open mind, do not disdain the old but be adaptable to progress. Remember that there is no substitute for experience. Be deliberate and inquiring, do not rush headlong when it is not necessary. Be humble and patient, however great your rewards. Be democratic, treat the rich and poor alike with courtesy and consideration.

As physicians you should also be read in the world's literature and maintain a background of acquaintance with other fields of science and work. You should invest as much time as you can in outside interests and activities in other fields. You must develop and cultivate the human touch and not make the mistake of neglecting to cultivate other pursuits and of becoming a one-sided, single faceted person. You should, when the occasion permits, travel and mingle with people of all degrees for the ripening and leavening effect on your own personality.

Therefore, by virtue of your training and experience as physicians, you must realize and accept your basic responsibilities to the community. To a great degree, like those of the minister, priest or rabbi, your lives must be dedicated to the expansion and fulfilment of the common rights of man's freedom, health, and happiness, and the general improvement of mankind. Your privileges, and they are many, carry with them these responsibilities.

In conclusion, let me congratulate you upon the completion of your medical preparation. You may feel that you are being graduated at an unfortunate time and era. May I assure you that you are most fortunate, because the opportunities now are infinitely greater to help reconstruct a new way of living for all nations. I believe it is more important for one to deserve to win than it is to win.

I am convinced that our own age is witnessing, as a result of the suffering we will experience, a real purging which will bring spiritual rebirth. True spiritual progress can only be achieved through pain and suffering. God manifests himself less through improvements in standards of living, social and labor reforms. We need a rebirth of the faith in the God of the Jews of the Babylonian Captivity and in the God of the Garden of Gethsemane.

PROCEEDINGS
of the
University of Maryland Biological Society

Officers of the Society

Sylvan E. Forman, *President*
School of Medicine
Baltimore, Md.

William E. Hahn, *Treasurer*
School of Dentistry
Baltimore, Md.

W. L. Hard, *Secretary*
School of Medicine
Baltimore, Md.

Ronald Bamford, *Secretarial Representative*
Department of Botany
College Park, Md.

Councilors

Edward C. Dobbs
C. Jelleff Carr
Thomas C. Grubb
Robert H. Oster

A business meeting of the Society was held on December 2, 1942, at 4:00 P.M. in the Bressler Lecture Hall, at which the following officers were elected:

President: Dr. Sylvan E. Forman

Secretary: Dr. W. L. Hard

Treasurer: Dr. William E. Hahn

Secretarial Representative at College Park: Dr. Ronald Bamford

Councilor for one year: Dr. Robert H. Oster

The following candidates were elected to membership:

Full membership: Dr. Vera E. James

Dr. Glenn S. Weiland

Associate membership: Miss Edith J. Wiegand

Mr. A. M. Mattocks

Mr. W. M. Whaley

**ONE HUNDRED AND TWENTY-FOURTH PROGRAM
MEETING**

The One Hundred and Twenty-Fourth Program Meeting was held on Wednesday, January 20, 1943, at 4:00 P.M. in the Bressler Lecture Hall.

The following program was presented:

"Treatment of Experimentally Produced Staphylococcic Thoracic Empyema."

1. Introduction, experimental procedure, and methods of treatment, by William E. Evans, Jr., Ph.D., Department of Pharmacology, School of Medicine, University of Maryland.

2. History of culture, agents used in treatment of local infections, and bacteriologic findings, by James G. McAlpine, Ph.D., Department of Bacteriology, School of Medicine, University of Maryland.
3. Review of cytohistologic investigations, study of pleural exudates, and cytohistologic findings, by Benedict Skitarelic, M.D., Department of Pathology, School of Medicine, University of Maryland.
4. Clinical treatment of empyema, by E. Howard Tonolla, M.D., Department of Medicine, School of Medicine, University of Maryland.

An abstract of this program follows.

TREATMENT OF EXPERIMENTALLY PRODUCED STAPHYLOCOCCIC THORACIC EMPYEMA

WILLIAM E. EVANS, JR., PH.D.,* AND (by invitation) JAMES G. McALPINE, PH.D.,**
BENEDICT SKITARELIC, M.D.,† AND E. HOWARD TONOLLA, M.D.‡

Staph. thoracic empyema was produced experimentally in approximately 100 rabbits with little or no septicemia. These animals were treated locally with drugs alone and in combination, with and without the addition of immune serum.

The most promising methods of treatment were with (1) azochloramid and sulfanilamide, (2) azochloramid and sodium tetracyclisulfate, (3) immune serum and complement, and (4) immune serum and azochloramid.

The period of treatment was limited to five days. More extensive treatment by the foregoing methods is contemplated.

ONE HUNDRED AND TWENTY-FIFTH PROGRAM MEETING

The One Hundred and Twenty-Fifth Program Meeting was held on Tuesday, February 9, 1943, at 4:00 P.M. in the Bressler Lecture Hall.

The program consisted of a paper on "Recent Advances in the Prevention of Dental Caries" by Joseph F. H. Volker, D.D.S., Ph.D., Professor of Clinical Dentistry and Director of Clinics, Tufts School of Dentistry, Boston, Mass.

ONE HUNDRED AND TWENTY-SIXTH PROGRAM MEETING

The One Hundred and Twenty-Sixth Program Meeting was held on Wednesday, March 10, 1943, at 4:00 P.M. in the Bressler Lecture Hall.

Mr. Alfred Tennyson of the Bureau of Narcotics, Treasury Department, Washington, D. C., presented a paper on "Narcotic Drug Traffic Control."

An abstract of this paper follows.

* From the Department of Pharmacology, School of Medicine, University of Maryland.

** From the Department of Bacteriology, School of Medicine, University of Maryland.

† From the Department of Pathology, School of Medicine, University of Maryland.

‡ From the Department of Medicine, School of Medicine, University of Maryland.

NARCOTIC DRUG TRAFFIC CONTROL*

The Federal Bureau of Narcotics performs a dual function in that it seeks to prevent the traffic in narcotic drugs for unlawful purposes while arranging that there shall be available within the United States sufficient supplies of narcotic drugs to provide for all proper medical and scientific needs. All supplies of narcotic raw material, crude opium and coca leaves are imported from abroad pursuant only to import permit issued by the Commissioner of Narcotics. Secretary Morgenthau and the Commissioner of Narcotics in 1937 first saw the probability of interruption to shipments of opium from the Near East and made arrangements with importing manufacturers to import considerably larger shipments of crude opium than had theretofore been brought in under a year-to-year supply plan. There has resulted an accumulation in Government custody of a reserve supply of this critical and strategic material which precludes any foreseeable shortage of opium derivatives for medical purposes.

A gratifying degree of success has been achieved in suppressing the illicit contraband traffic in narcotics. Important features in this achievement were the adoption and enforcement of the Manufacturing Limitation Convention of 1931 drastically curtailing foreign manufacturing overproduction which fed the illicit trade, and the plan of coordinating the Treasury enforcement agency activity, using the facilities particularly of the Bureau of Narcotics, the Bureau of Customs, and the Coast Guard. An important index of the success achieved is the decrease noted in the ordinary drug addict population which, according to a survey, is measured by a ratio of less than two drug addicts to each 10,000 of the general population.

The drastic shortage of narcotics in ordinary *bootleg* channels has caused drug addicts and peddlers to attempt to tap legitimate medical supply channels. Thus, there are noted robberies and thefts of narcotics from drug stores and physicians' offices, the forging of narcotic prescriptions, and frequent purchases of paregoric from drug stores in states where prescriptions for paregoric are not required.

Diversions on a large scale have been noted through the instrumentality of a comparatively few unethical physicians who are willing to prescribe or sell in the aggregate large quantities of morphine to addicts for the sake of financial gain. In some other cases a few physicians have been extremely careless in consenting to prescribe or dispense narcotics to addicts under circumstances which were, to say the least, questionable.

A number of irregularities were noted among some members of the medical profession with respect to transactions in narcotic drugs. These included the writing of so-called narcotic prescriptions to obtain drugs for office use instead of purchasing them upon an official order form, and the telephoning of orders to the druggist for narcotic drugs for a patient without providing a covering prescription. A number of physicians fail to register on time (July first of each year) and fail to report promptly a change of address to the Collector of Internal Revenue after being registered.

The broad policy should be to give effective treatment to the addict looking toward a cure of his addiction and to aid him in remaining cured by withholding from him the drug to which he was formerly addicted. In the administration of this broad general policy the Bureau bespeaks the aid and cooperation of the medical profession.

* From the Federal Bureau of Narcotics.

ALUMNI ASSOCIATION SECTION

OFFICERS

HENRY J. WALTON, M.D., *President*

Vice-Presidents

REAR ADMIRAL CHARLES H. T. LOWNDES J. WALTER LAYMAN, M.D.

BENJAMIN S. RICH, M.D., *Secretary*

FREDERICK W. STEINER, M.D.

KENNETH LEGGE, M.D., *Assistant Secretary*

EDWARD P. SMITH, M.D., *Treasurer*

Board of Directors

WALTER D. WISE, M.D.,

Chairman

HENRY J. WALTON, M.D.

EDGAR B. FRIEDENWALD, M.D.

BENJAMIN S. RICH, M.D.

GEORGE McLEAN, M.D.

WILLIAM H. SMITH, M.D.

EDWARD P. SMITH, M.D.

CHARLES REIFSCHEIDER, M.D.

KENNETH LEGGE, M.D.

Hospital Council

ALFRED T. GUNDRY, M.D.

GEORGE SARGENT, M.D.

Nominating Committee

JOHN E. SAVAGE, M.D.,

Chairman

OLIVER S. LLOYD, M.D.

J. SHELDON EASTLAND, M.D.

WILLIAM SEABOLD, M.D.

FRANK GERAGHTY, M.D.

Library Committee

WILLIAM S. LOVE, JR., M.D.

Trustee Students' Rotating Fund

FRANCIS J. KIRBY, M.D.,

Chairman

R. L. MITCHELL, M.D.

A. F. RIES, M.D.

EUGENE HAYWARD, M.D.

Editors

EMIL NOVAK, M.D.

C. GARDNER WARNER, M.D.

Alumni Council

WILLIAM H. TRIPLETT, M.D.

THOMAS B. AYCOCK, M.D.

The names listed above are officers for the term beginning July 1, 1942 and ending June 30, 1943

COMMENCEMENT EXERCISES

MARCH 25, 1943

The Lyric—Baltimore

ORDER OF EXERCISES

- I. THE PROCESSION: *The Coronation March*, Meyerbeer; *Pomp and Circumstance*, Elgar.
 - II. INVOCATION: REV. BOYD R. HOWARTH, *Rector of the Memorial Protestant Episcopal Church*.
 - III. GREETING: H. C. BYRD, B.S., LL.D., D.Sc., *President, University of Maryland*.
 - IV. THE ADDRESS: MAJOR L. A. M. KRAUSE, M.C., A.U.S., *Associate Professor of Medicine, School of Medicine*.
 - V. CONFERRING OF DEGREES AND CERTIFICATES: PRESIDENT H. C. BYRD.
- PRESENTATION OF GRADUATES: DR. H. BOYD WYLIE, *Assistant Dean*.

Class Roll

Alberto Lotfalla Adam
 Marcus Lafayette Aderholdt, Jr.
 Richard Charles Allsopp
 Ramon Ignacio Almodovar
 Emory Forester Baker
 John David Barnes
 Robert Zinn Berry
 James Wooten Bizzell

Charles Vernon Bowen, Jr.
 Thomas Joseph Brennan
 Sherman Simons Brinton
 Ralph King Brooks
 Ross Chilton Brooks
 William James Bryson
 Ralph Stallings Chenoweth
 Harry Cohen

John Benedict Coughlin
 Donald Lawrence Courtney
 Philip Crastnopol
 Benedict Albert Cusani
 Miguel Sebastian Dalmau
 William Joseph Graham Davis
 John Daniel Diorio
 Thomas Benjamin Dunne
 William Robert Eaton
 John Wallace Walker Epperson
 Richard Lowman Fowler
 Samuel Lawson French
 Paul Norman Friedman
 Alfred Selman Garrison
 Tony Robert Giglia, Jr.
 Raymond Bernard Goldberg
 Jose Ignacio Grave de Peralta
 David Benoni Gray
 William Baker Hagan
 Frank Stanley Hassler, III
 Alvin Herbert Honigman
 William Jack Hunt
 William Romulus Jenkins
 Robert Franklin Keadle
 Robert Charles LaMar, Jr.
 Ferdinand Wayne Lee
 Richard Quarles Lewis
 Robert Charles Livingstone
 Paul George Lukats
 Charles Renwick MacDonald
 Joseph Charles Matchar
 Marcy Emory McMillan, Jr.
 Vincent James Mele, Jr.
 Nestor Hernan Mendez
 James Delmar Miller
 Robert Virginius Minervini
 John David Morris
 Henry Musnick
 Joseph Carl Myers
 Kenneth Powell Nash
 Charles Amos Neff

Maria Amalia Pares
 Frank Strong Parrott
 Enrique Perez
 Henry Baker Perry, Jr.
 Preston Horsley Peterson
 Joseph Emmett Queen
 Raymond Veto Rangle
 Josephine Elizabeth Renshaw
 Granville Hampton Richards
 Martin Albert Robbins
 Louis Nathan Rosenstein
 Earl Linwood Royer
 Richard Sprogoe Rude
 Seymour Sacks
 Irving Leonard Samuels
 Nathaniel Sharp
 John Wiltshire Sigler
 Marta Emilia Soler-Favale
 Andrew Allan Spier
 Harold Rellinger-Stafford
 Edwin Harvey Stewart, Jr.
 Howard William Stier
 James Ernest Stoner, Jr.
 Irving Julian Taylor
 Jose Manuel Torres
 Charles Weldon Trader
 Robert Boone Tunney
 Stephen Joseph Van Lill, III
 Joseph Gregory Varhol, Jr.
 Irvin Louis Wachsman
 Samuel Haywood Walker
 Frank Orville Warren, Jr.
 Thomas Clyde Webster
 Maurice Richard Weiss
 Joseph Carlton Wich
 Oliver Wayne Williamson
 Thomas Leslie Wilson
 Robert Edward Wise
 Arthur Overton Wooddy
 David Kuykendall Worgan
 Leonard Emory Yurko

VI. AWARDING OF HONORS: DR. ROBERT U. PATTERSON, *Dean*.

UNIVERSITY PRIZE GOLD MEDAL

Paul Norman Friedman

CERTIFICATES OF HONOR

Philip Crastnopol
 Kenneth Powell Nash

Martin Albert Robbins
 Louis Nathan Rosenstein

David Kuykendall Worgan

The Dr. A. Bradley Gaither Memorial Prize for the best work in genito-
 urinary surgery during the senior year: David Kuykendall Worgan

VII. ADMINISTERING OF HIPPOCRATIC OATH: ARTHUR M. SHIPLEY, M.D.,
 Sc.D., *Professor of Surgery*.

VIII. BENEDICTION: REV. BOYD R. HOWARTH, *Rector of the Memorial
 Protestant Episcopal Church*.

IX. THE RECESSION: *March of the Priests*, Mendelssohn.

THE 136TH ANNUAL BANQUET

The 136th Annual Banquet of the Medical Alumni Association of the University of Maryland was held on March 24, 1943 at the Lord Baltimore Hotel, Baltimore. The speakers on the program were:

Benediction: Rev. John H. Gardner, Jr., Rector of the First Presbyterian Church

Dr. H. C. Byrd, President of the University of Maryland

Senator Millard E. Tydings, Guest Speaker

James Delmar Miller, President of the Senior Class

Maj. Gen. Robert U. Patterson, U.S.A. (Retired), M.D., Dean of the School of Medicine and Superintendent of the University Hospital

Dr. Henry J. Walton, Toastmaster

In addition, the following were guests of honor:

His Excellency Herbert R. O'Connor, Governor of Maryland

The Honorable Howard W. Jackson, Mayor of Baltimore

Members of the Board of Regents

Graduates of the Class of 1943

Graduates of the Class of 1888

ITEMS

UNIVERSITY OF MARYLAND ALUMNUS MADE PRESIDENT-ELECT OF THE
SOUTHERN MEDICAL ASSOCIATION

The Richmond meeting of the Southern Medical Association held November 10-12, 1942 shone particularly in its selection of officers for the coming year. The new President-Elect, Dr. William Turnor Wootton, is one of its most efficient and oldest friends, a man long popular with its members. An intimate of the men who organized the Association and an active participant in its earliest activities, he served as chairman of the committee on arrangements for the Hot Springs' meeting in 1921 and made that meeting a memorable event. He has been chairman of the Section on Medicine of the Association and has served on its Council.

Born in Poolesville, Maryland on April 12, 1878, Dr. Wootton was the son of a physician, Dr. Edward Wootton, who rode horseback from the District of Columbia to the Blue Ridge Mountains of Virginia, covering his practice after the Civil War. His ancestors were also doctors, reaching back to Turnor Wootton, physician to the London Company that settled Jamestown under John Smith. Prior to that a Turnor Wootton was physician to Queen Elizabeth.

The President-Elect was educated in public schools at Poolesville, attended the Maryland Agricultural College at College Park from 1891 to 1895, after which he entered the School of Medicine of the University of Maryland and graduated in 1899 at the age of twenty-one.

Dr. Wootton served his internship at the University Hospital and was later assistant physician at the Maryland State Hospital in Catonsville. He entered the Army as a contract surgeon in August, 1900, during the Spanish-American War, was sent to the Phillipines and served at Santa Mesa and First Reserve Hospitals in Manila. He was advanced to the rank of Captain and Assistant Surgeon U.S.V. In the field, with headquarters at Los Banos he served with the 21st U. S. Infantry in General Malvar's campaign. He was transferred to the civil government for board of health work during the cholera epidemic and was an original member of the Military Order of the Carabao, a Philippine order of importance. This organization has among its members the old-timers and the heads of the present services.

After returning to the United States early in 1903 Dr. Wootton located in Hot Springs, Arkansas for the practice of medicine. In 1904 he married Emma Wilson Whittington and they have two daughters.

Dr. Wootton has been President of his local county and state medical societies and has been active in other medical and scientific societies. He led the fight which culminated in the passage of the Gant Act which freed Hot Springs of the evils of drumming, thus elevating the standard of medical practice in his home city. At home he is a deacon in the Presbyterian Church and being a man of wide sympathies has headed many charitable organizations. He has made many contributions to medical literature and devoted much time in recent years to the study of arthritis and the role of allergy in synovitis.

During his early membership in the Southern Medical Association Dr. Wootton proved himself a true friend when friends were most needed. A distinguished internist, his winning personality and wisdom of council have made him a leader in organized medicine and in civil activities throughout his period of medical practice. His work and directive gifts will be appreciated during his tenure of office.

UNIVERSITY OF MARYLAND GRADUATE COMMISSIONED AS BRIGADIER GENERAL

Dr. Norman Thomas Kirk was commissioned as Brigadier General of the United States Army on March 27, 1943. General Kirk was born in Rising Sun, Maryland on January 3, 1888. He graduated from Tome School in 1907, the School of Medicine of the University of Maryland in 1910, the Army Medical School in 1913, and from the advanced course of the Army Field Service School in 1931.

General Kirk entered the Medical Reserve Corps in 1912 as a First Lieutenant. He advanced at regular intervals and was honorably discharged after World War I as a Lieutenant Colonel. On May 22, 1933 Dr. Kirk was recommissioned as a Lieutenant Colonel. He became a Colonel on May 22, 1939 and a Brigadier General in March of this year.

In 1914 General Kirk served in Vera Cruz, México. He was chief of the amputation and orthopedic sections of Walter Reed General Hospital, Washington, D. C., from 1919 to 1925, 1930 to 1934, and 1941 and 1942; orthopedic section of Station Hospital, Fort Sam Houston, Texas, 1925 to 1928; surgical service, Sternberg General Hospital, Manila, Philippine Islands, 1928 to 1930, 1934 to 1936; surgical service, Letterman General Hospital, San Francisco, Calif., 1936; commanding officer of Percy Jones General Hospital, Battle Creek, Michigan in 1943.

General Kirk is an authority on war amputations. He wrote on this subject in "Lewis' Practice of Surgery" and on tetanus in Nelson's "Loose-leaf Surgery."

He is a member of the American Medical Association, American Orthopedic Association, American Surgical Association, American Orthopedic Society, Academy of Orthopedic Surgery, and the Academy of Traumatic Surgery; fellow of the American College of Surgeons; and a Diplomate of the American Board of Surgery.

The University is indeed proud of such a distinguished alumnus.

Since going to press, General Kirk has been nominated to be surgeon general of the Army, with the rank of Major General, to become effective June 1, 1943. General Kirk is the fourth surgeon general of the Army who has come from the State of Maryland.

COL. MAURICE C. PINCOFFS APPOINTED CHIEF CONSULTANT IN MEDICINE TO
THE U. S. ARMED FORCES IN THE FAR EAST

Dr. Maurice C. Pincoffs, commanding officer of the United States Army General Hospital No. 42 now serving in the southwestern Pacific, has been named chief consultant in medicine to the U.S. Armed Forces in the Far East with the rank of Colonel. This hospital was one of two organized from the staffs of the University Hospital and the School of Medicine of the University of Maryland.

Appointment of Dr. Pincoffs to this important Army medical post was confirmed by the War Department upon the recommendation to the Commanding General of the southwestern Pacific area.

A native of Chicago, Dr. Pincoffs was graduated from the Johns Hopkins University School of Medicine in 1912. He was one of the first physicians to enter the Army's medical service during World War I. In 1917 Dr. Pincoffs served as a battalion medical officer with the British forces. Later he was placed in charge of a hospital organized by the American Red Cross in France. After the war Dr. Pincoffs resumed his medical practice in Baltimore and in 1921 was named head of the Department of Medicine of the School of Medicine of the University of Maryland.



COL. MAURICE C. PINCOFFS

Dr. Pincoffs also served as chairman of the committee on medical care of the Maryland State Planning Commission, and as chairman of the Board of Editors of the Bulletin of the School of Medicine, University of Maryland.

APPOINTMENT OF DR. THOMAS P. SPRUNT TO BOARD OF EDITORS

Dr. Thomas P. Sprunt has been appointed by Dean R. U. Patterson to serve as the medical member of the Board of Editors of the Bulletin of the School of Medicine, University of Maryland. This appointment was made to replace Dr. Louis A. M. Krause, who is now serving with the Armed Forces.

Dr. Sprunt was born in Virginia. He received his Bachelor of Arts degree from Davidson College, North Carolina, and the degree of Doctor of Medi-

cine from Johns Hopkins University School of Medicine in 1909. Dr. Sprunt was: assistant, instructor, and associate in pathology, Johns Hopkins University, 1909 to 1912; assistant resident physician, Johns Hopkins Hospital, 1912 to 1915; resident physician, Baltimore City Hospitals, 1915 and 1916; acting physician-in-chief, Baltimore City Hospitals, 1916 and 1917; Major in the Medical Corps, United States Army, 1917 and 1918.

Since World War I Dr. Sprunt has conducted his practice of medicine in Baltimore in addition to his duties as associate in medicine, Johns Hopkins University and visiting physician, Johns Hopkins Hospital. During the past ten years he has been associate professor and professor of clinical medicine in the School of Medicine of the University of Maryland.

Dr. Sprunt is a member of the American Clinical and Climatological Association and the Association of American Physicians, also a fellow of the American College of Physicians.

At the one hundred and thirty-seventh annual meeting of the Suffolk County (Long Island), New York, Medical Society, Dr. Edwin P. Kolb, U. of M., 1912, Major, Medical Corps, Camp Upton, was reelected secretary for the seventeenth consecutive year. Dr. Willetts W. Gardner, U. of M., 1921, Patchogue, was reelected assistant secretary for the third consecutive year, and Dr. Grover A. Silliman, B.M.C. 1913, Sayville, was reelected treasurer for the fifteenth consecutive year.

The following graduates of the University Schools are members of the Suffolk County Medical Society: David F. Brody, Bay Shore, U. of M., 1934; Frank C. Dildine, Port Jefferson, B. M. C., 1897; Frank Edgett, Amityville, B. M. C., 1912; Benjamin F. Gallant, Huntington, P. & S., 1913; Willetts W. Gardner, Patchogue, U. of M., 1921; William A. Gollick, Kings Park, U. of M., 1922; J. Mott Jeath, Greenport, P. & S., 1913; Edwin P. Kolb, Holtsville, U. of M., 1912; Morley B. Lewis, Sag Harbor, B. M. C., 1896; Arthur C. Loper, Greenport, P. & S., 1896; Ralph G. Reed, Central Islip, B. M. C., 1908; Grover A. Silliman, Sayville, B. M. C., 1913.

The honorary degree of Doctor of Pharmacy was conferred upon Dr. Thomas M. Pascall by the New Jersey College of Pharmacy of Rutgers University on January 6, 1943 in the auditorium of the Mutual Benefit Life Insurance Company at Newark, N. J.

Dr. Pascall, a practicing physician in Newark, is chief surgeon of Public Service and is medical consultant of the Fidelity Union Trust Company. He is a graduate of the Baltimore Medical College, Class of 1906. Dr. Pascall also attended the New Jersey College of Pharmacy where he was Professor of Pharmaceutical Jurisprudence from 1910 to 1913. He is a

registered pharmacist in New Jersey. Dr. Pascall served his internship in Maryland and also in St. Michael's Hospital, Newark.

He is a member of the American Medical Association, New Jersey State Medical Association, Essex County Medical Society, and the New Jersey Medico Pharmaceutical Committee.

Dr. Thomas S. Saunders, Class of 1932, was recently appointed consulting dermatologist to the United States Veterans' Administration Hospital at Portland, Oregon.

MEDICAL LIBRARY NOTES

BIBLIOGRAPHY OF FACULTY PUBLICATIONS

The staff of the Medical Library is working on the preparation of a bibliography of books and articles written by members of the staff and faculty of the School of Medicine and published during 1942. It is planned to make this an annual compilation.

PRESERVATION OF ALUMNI AND FACULTY PUBLICATIONS

In this connection it should be emphasized again that the Medical Library is extremely desirous of having a complete file of faculty and alumni publications. It will help materially if members of the University will send to the Library for permanent preservation two copies of reprints of articles and a copy of their books.

To those who have contributed during the past year sincere thanks are extended. A complete list of the gifts and their donors would be too long for inclusion here. This announcement will serve as a general expression of gratitude.

MEDICAL LIBRARIANSHIP

An article by Miss Julia Wilson, of the Library staff, entitled "Professional Librarianship among Medical Librarians," appeared in the January issue of the Bulletin of the Medical Library Association. Dubbed *controversial* by the editor of the Bulletin it raises several points of importance in the field of medical librarianship.

NEW PERIODICALS

Attention is directed to the appearance of two new journals, namely, *Archives of Biochemistry*, which appeared for the first time with the October, 1942 issue, and *Gastroenterology*, first issued in January, 1943. The former intends to cover the field of chemical structure and reactions of living organisms, and the latter is the official publication of the American Gastroenterological Association. Both may be obtained in the Medical Library.



Elmer B. Freeman, B.S., M.D.

OBITUARIES

RUFUS CECIL FRANKLIN, M.D.

Dr. Rufus Cecil Franklin of Swainsboro, Georgia, died on December 4, 1942.

Dr. Franklin, a prominent physician in his section of Georgia, was born in 1881 and graduated from the School of Medicine of the University of Maryland in 1907. His record as a student and house officer was excellent. Dr. Franklin specialized in surgery and was a member of the Southeastern Surgical Congress.

ELMER B. FREEMAN, B.S., M.D.

Dr. Elmer Burkitt Freeman, chief of the medical staff of the Maryland General Hospital, died on December 23, 1942. He was sixty-seven years of age.

Dr. Freeman was born in Mattoon, Illinois, and received his Bachelor of Science degree from Austin College in 1896 and the degree of Doctor of Medicine from the Baltimore Medical College in 1900. After taking a post-graduate course at the Johns Hopkins University School of Medicine he became resident physician at the Maryland General Hospital. The following year he was appointed visiting physician and in 1917 became physician-in-chief. He was also assistant visiting physician at the Church Home and Infirmary, St. Agnes Hospital, and Bon Secours Hospital. He was a member of the staff of the Union Memorial Hospital and assistant in clinical medicine at the Johns Hopkins Hospital. He taught from 1901 to the time of his death and published many articles, chiefly on diseases of the esophagus and stomach.

Dr. Freeman was a member of the American College of Physicians, the American Medical Association, the American Gastroenterological Association, the Medical and Chirurgical Faculty of Maryland, the Southern Medical Association, and the Baltimore City Medical Society. He was an honorary member of the State Medical Society of Minnesota, and a fellow of the Premier Congress International de Gastro-Enterologie and the National Society for the Advancement of Gastroenterology. He was also a member of the board of the Maryland Tuberculosis Association.

ZACHARIAH R. MORGAN, M.D.

ABRAM S. SAMUELS, M.D.

Dr. Abram S. Samuels, Clinical Professor of Gynecology of the School of Medicine, University of Maryland, and chief of the gynecologic service at



Abram S. Samuels, M.D.

Mercy Hospital, died at that hospital on February 7, 1943 of coronary thrombosis following a short illness.

Dr. Samuels was born in Baltimore on August 27, 1876. His childhood and early manhood were filled with hard work and an earnest struggle to obtain an education. Dr. Samuels studied in the public schools and was a graduate pharmacist before he began the study of medicine. In 1897 he obtained his degree in medicine from the College of Physicians and Surgeons.

This kindly, sympathetic man had a rare intelligence which he cultivated by study and prodigious reading. He was mostly interested in biblical, scientific, and biographical works. Dr. Samuels also wrote numerous articles which were published in various medical journals. All of these papers related to some phase of gynecology, his specialty. Besides his reading and writing Dr. Samuels had many hobbies, being interested chiefly in photography and wood carving. He turned out many choice pieces of furniture, each piece being an authentic copy of some good period style.

When the Research Club was formed at the College of Physicians and Surgeons Dr. Samuels was one of the charter members. He was also one of the early members of the American College of Surgeons.

The untimely passing of this talented surgeon is the source of genuine sorrow and loss to all his friends and colleagues at the University of Maryland and at Mercy Hospital.

THOMAS K. GALVIN, M.D.

Babcock, Warren LaVerne, Detroit, Mich.; P. & S., class of 1893; aged 69; died, December 27, 1942, in St. Petersburg, Fla., of coronary thrombosis.

Boaz, Volney T., Manson, Wash.; B.M.C., class of 1895; aged 81; died, November 19, 1942, of cerebral hemorrhage.

Boone, Walter, Gaffney, S. C.; class of 1919; served during World War I; aged 49; died, January 1, 1943.

Carroll, William L., Struthers, Ohio; B.M.C., class of 1894; aged 77; died, September 22, 1942, of arteriosclerosis.

Compton, Booton Stover, Atlanta, Ga.; class of 1910; aged 59; died, December 26, 1942, of a fracture resulting from a fall in his home.

Conley, Henry Carroll, Boone, Iowa; class of 1885; aged 80; died, September 26, 1942, of cerebral hemorrhage.

Cranford, Oscar G., Sasser, Ga.; B.M.C., class of 1892; aged 76; died, October 25, 1942, in a hospital in Moultrie, Ga.

Davenport, William Leslie, Amelia Court House, Va.; P. & S., class of 1893; aged 81; died, December 22, 1942, of coronary thrombosis.

Davis, George Hicks, Hollidays Cove, W. Va.; B.M.C., class of 1905; aged 66; died, November 20, 1942, of cerebral hemorrhage.

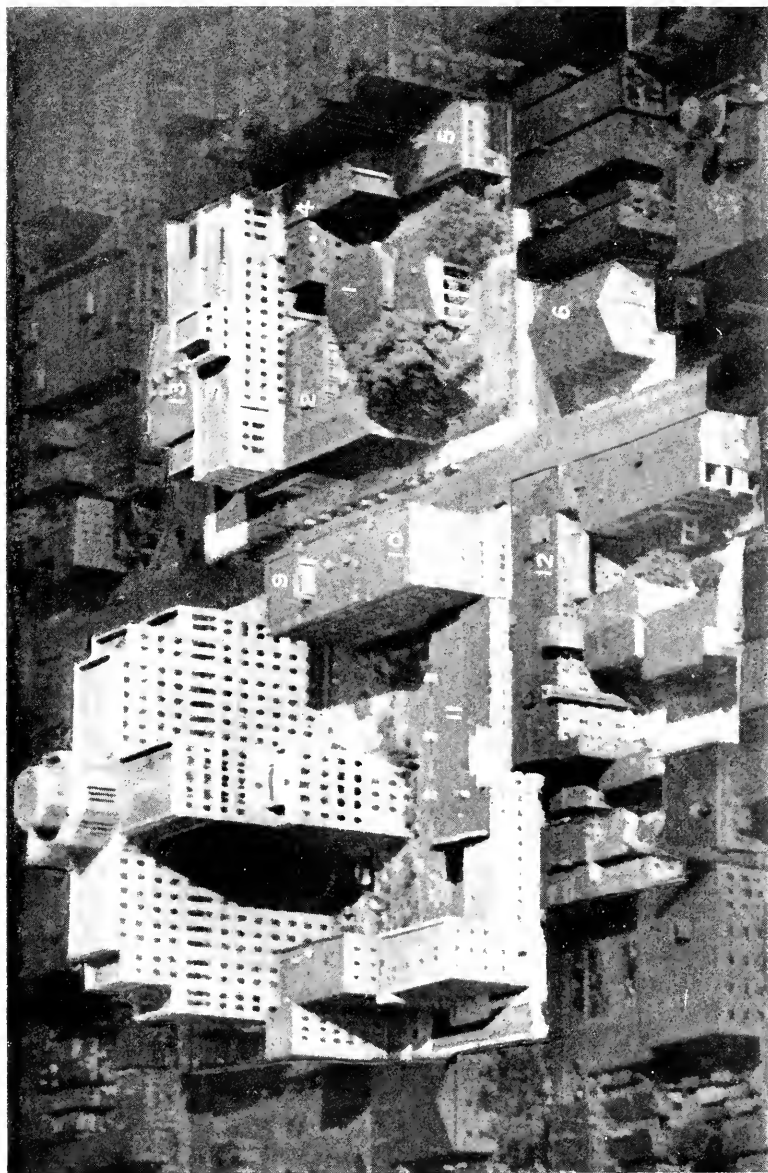
- de Vebre, John Witt**, Ronceverte, W. Va.; class of 1886; aged 80; died, October 28, 1942, of coronary thrombosis.
- Edwards, Joseph Benjamin**, Swansea, S. C.; class of 1911; served during World War I; aged 55; died, December 14, 1942, of heart disease.
- Grimm, Alva Silas**, St. Mary's, W. Va.; P. & S., class of 1885; aged 85; died, December 24, 1942, of hypostatic pneumonia.
- Hayden, John Joseph**, Worcester, Mass.; B.M.C., class of 1908; aged 62; died, November 26, 1942.
- Heimer, Fred Stanley**, Unadilla, N. Y.; B.M.C., class of 1910; served during World War I; aged 61; died, November 27, 1942.
- Hill, Cephas Cole**, Darlington, S. C.; class of 1904; aged 64; died, November 8, 1942.
- Holmes, Walter B.**, Wadley, Ga.; B.M.C., class of 1892; aged 72; died recently.
- Hurd, James T.**, Galetton, Pa.; P. & S., class of 1885; aged 83; died, November 1, 1942, of coronary thrombosis.
- Jenkins, Robert Lee**, Winston-Salem, N. C.; P. & S., class of 1903; aged 71; died, November 1, 1942, of a heart attack following an illness of three years.
- Joyce, Leo Harold**, Passaic, N. J.; B.M.C., class of 1902; aged 64; died, December 7, 1942.
- Kirk, Robert S.**, Baltimore, Md.; B.M.C., class of 1896; aged 71; died, December 1, 1942, of pneumonia.
- Liston, Arthur Corliss**, Bellows Falls, Vt.; B.M.C., class of 1906; served during World War I; aged 58; died, November 10, 1942, of carcinomatosis.
- MacMullen, John William**, South Mountain, Pa.; P. & S., class of 1904; served during World War I; aged 63; died, November 17, 1942, of cardiovascular disease.
- Marriott, Henry B.**, Battleboro, N. C.; class of 1883; aged 79; died, October 24, 1942, of pneumonia.
- Mason, Robert French**, Washington, D. C.; class of 1894; aged 73; died, October 29, 1942, of coronary occlusion and-coronary sclerosis.
- Merriam, Charles E.**, Rochester, Vt.; B.M.C., class of 1894; aged 78; died, December 23, 1942, of auricular fibrillation.
- Price, John Joseph**, Olyphant, Pa.; B.M.C., class of 1896; served during World War I; aged 68; died, October 28, 1942, in Wilkes Barre, Pa.
- Redding, Alexander H.**, Cedar Falls, N. C.; P. & S., class of 1887; aged 85; died, November 16, 1942, of heart disease.
- Robbins, Charles Henry**, Altadena, Calif.; B.M.C., class of 1895; aged 73; died, September 9, 1942, of myocarditis.

- Robinson, Howard Thomas**, Cumberland, Md.; class of 1904; aged 62; died suddenly, December 3, 1942, of coronary occlusion.
- Rusmiselle, Leslie T.**, Washington, D. C.; P. & S., class of 1913; served during World War I; aged 54; died, December 26, 1942, of carcinoma.
- Spicer, Joseph H.**, Cumberland, Md.; B.M.C., class of 1910; aged 56; died, November 30, 1942, of chronic myocarditis.
- Stein, Albert**, Thompsonville, Conn.; class of 1917; aged 48; died, December 5, 1942; of uremia, acute hemorrhagic nephritis, and pulmonary edema.
- Titus, Charles William**, Bloomfield, N. J.; P. & S., class of 1897; served overseas during World War I; aged 66; died, November 5, 1942, of diabetes mellitus and heart disease.
- Voorhies, Joseph Lane**, Columbia, Tenn.; P. & S., class of 1886; aged 82; died, October 24, 1942, of heart disease.
- Webb, Harold Homer**, Ottumwa, Iowa; class of 1912; aged 50; died, November 4, 1942.

INDEX TO VOLUME 27

Abscess, nonosseous retroperitoneal, Perforation of bladder by, Moses Gellman	90
Address to Class of 1942, C. Reid Edwards	46
Amberson, William R.	127
Baltimore Junior League Curative Workshops, End results obtained in, Nancy Valliant.	96
Beck, Harvey G.	69
Biblical portrait of old age, Louis A. M. Krause	117
Bladder, Perforation of, by nonosseous retroperitoneal abscess, Moses Gellman	90
Brantigan, O. C.	165, 212
Briele, Henry A.	146
Carcinoma, Embryonal, of testicle, Henry A. Briele	146
Carcinoma of esophagus, O. C. Brantigan and A. M. Shipley	165
Commencement Exercises	55, 57, 224
Constipation, Indiscriminate use of purgatives in, Harvey G. Beck and Louis J. Kroll	69
Coonan, Major Thomas J.—Obituary	177
Cordell Historical Society of University of Maryland, Activities of	64, 121
Department of Obstetrics, School of Medicine, University of Maryland, 1941 Annual Report, Louis H. Douglass	204
DiStasio, Frank	85
Douglass, Louis H.	30, 204
Editorial. Maj. Gen. Robert U. Patterson, U. S. A. (Retired), appointed Dean of School of Medicine and Superintendent of Hospital	125
Edwards, C. Reid	46
Esophagus, Carcinoma of, O. C. Brantigan and A. M. Shipley	165
Estrone, Inactivation of, by light, Frank H. J. Figge	159
Figge, Frank H. J.	159
Franklin, Rufus Cecil—Obituary	233
Freeman, Elmer B.—Obituary	233
Gases, Transfer of, in body: some military aspects, Robert H. Oster	1
Gellman, Moses	90
Goldstein, Albert E.	183
Gonadotropins and gonadal hormones in male, Herbert Schoenrich	13
Hemorrhage, massive intestinal, from Meckel's diverticulum, Milton S. Sacks	197
Horseshoe kidneys, Pathologic conditions encountered in, Albert E. Goldstein	183
Hunter, William, and his magnum opus, J. E. Savage	103
Intestinal hemorrhage, massive, from Meckel's diverticulum, Milton S. Sacks	197
Items	63, 121, 175, 226
Kidneys, horseshoe, Pathologic conditions encountered in, Albert E. Goldstein	183
Kirk, Norman Thomas, commissioned as Brigadier General	227
Krause, Major Louis A. M., M.C., A.U.S.	117, 215
Kroll, Louis J.	69

Labor, Prolonged, Robert F. Linn and Louis H. Douglass	30
Linn, Robert F.	30
Maldeis, Howard J.	34
Meckel's diverticulum, Massive intestinal hemorrhage from, Milton S. Sacks.	197
Medical Examiner System, History of, Howard J. Maldeis.	34
Medical Library Notes.	175, 231
Mitchell, Robert Levis—Obituary	179
Obituaries.	66, 122, 179, 233
Osteomyelitis, Chronic staphylococcic, Frank DiStasio.	85
Oster, Robert H.	1
Pathologic conditions encountered in horseshoe kidneys, Albert E. Goldstein.	183
Patterson, Maj. Gen. Robert U., U. S. A. (Retired)—appointment of.	125
Pincoffs, Col. Maurice C., appointed Chief Consultant in Medicine to U. S. Armed Forces in Far East.	228
Posture, standing, Physiologic adjustments to, William R. Amberson.	127
Proceedings of the University of Maryland Biological Society:	
One Hundred and Nineteenth Program Meeting.	53
One Hundred and Twentieth Program Meeting.	54
One Hundred and Twenty-First Program Meeting.	54
One Hundred and Twenty-Second Program Meeting.	172
One Hundred and Twenty-Third Program Meeting.	172
One Hundred and Twenty-Fourth Program Meeting.	221
One Hundred and Twenty-Fifth Program Meeting.	222
One Hundred and Twenty-Sixth Program Meeting.	222
Purgatives, Indiscriminate use of, in constipation, Harvey G. Beck and Louis J. Kroll.	69
Reunions.	60, 174
Sacks, Milton S.	197
Samuels, Abram S.—Obituary.	233
Savage, J. E.	103
Schoenrich, Herbert.	13
Shipley, A. M.	165
So help me God, Major Louis A. M. Krause, M.C., A.U.S.	215
Spring Activities.	63, 174
Sprunt, Thomas P., appointed to Board of Editors.	229
Testicle, Embryonal carcinoma of, Henry A. Briele.	146
United States Army Hospitals 42 and 142, photograph and personnel.	58, 59
Valliant, Nancy.	96
Varicose veins: safety cabinet for their injection, O. C. Brantigan.	212
Wootton, William Turnor, made President-Elect of Southern Medical Association.	226



BALTIMORE SCHOOLS—UNIVERSITY OF MARYLAND

1. Original Medical Building
2. Laboratory Building, Medicine
3. Bressler Building, Medicine
4. Gray Laboratory, Students' Lounge, Medicine
5. Administration Building, College of Education,
Baltimore Division
6. Medical Library
7. University Hospital
8. Nurses' Home, Medicine
9. School of Pharmacy
10. School of Dentistry
11. Dental Clinic
12. Out-Patient Clinics, Medicine
13. School of Law

BULLETIN
OF THE
SCHOOL *of* MEDICINE
UNIVERSITY OF MARYLAND



Announcements

The One Hundred Thirty-sixth Academic Session
June 25, 1942–March 25, 1943

and

The One Hundred Thirty-seventh Academic Session
April 8, 1943–December 23, 1943

Catalogue for September 25, 1941–May 30, 1942

SEPTEMBER, 1942

CONTENTS

	PAGE		PAGE
Calendar.....	4	Physiology.....	55
Calendars for 1942, 1943.....	5, 6	Bacteriology and Immunology.....	55
Organization.....	7	Biological Chemistry.....	56
Board of Regents.....	7	Pharmacology.....	56
University Senate.....	8	Pathology.....	56
Faculty of Physic.....	8	Medicine.....	57
Fellows.....	17	Clinical Pathology.....	61
University Hospital.....	18	Gastro-Enterology.....	62
Hospital Council.....	18	Psychiatry.....	62
Hospital Staff.....	18	Pediatrics.....	63
Resident and Intern Staff.....	20	Neurology.....	64
Dispensary Staff.....	22	Hygiene and Public Health.....	64
Dispensary Report.....	27	Medical Jurisprudence.....	65
Mercy Hospital.....	28	Surgery.....	65
Hospital Staff.....	28	Anaesthesia.....	68
Resident and Intern Staff.....	31	Dermatology.....	69
Dispensary Staff.....	32	Orthopaedic Surgery.....	69
Dispensary Report.....	34	Nose and Throat.....	70
Baltimore City Hospitals—Staff.....	34	Genito-Urinary Surgery.....	70
Kernan Hospital—Staff.....	36	Rectum and Colon.....	71
The School of Medicine.....	38	Otolary.....	72
History.....	38	Neurological Surgery.....	72
Buildings and Facilities.....	38	Oncology.....	72
Requirements for Admission.....	43	Oral Surgery.....	73
Application.....	43	Industrial Medicine and Surgery....	73
Minimum Requirements.....	43	Plastic Surgery.....	74
Combined Course in Arts and Sci- ences, and Medicine.....	44	Obstetrics.....	74
State Medical Student Qualifying Cer- tificates.....	45	Gynecology.....	75
Definition of Residence Status.....	45	Ophthalmology.....	76
Fees.....	46	Roentgenology.....	77
Rules for Payment of Fees.....	46	History of Medicine.....	77
Penalty for Non-Payment of Fees.....	46	Art as Applied to Medicine.....	78
Reexamination Fee.....	47	Schedules of Courses.....	79
Maintenance and Service Fee.....	47	Graduates, May 30, 1942.....	84
Personal Expenses.....	47	Internships, Graduates of 1942.....	85
Student Health Service.....	47	Matriculates.....	87
General Rules.....	48	Geographical Distribution of Students, 1941-1942.....	94
Prizes.....	49	College Sources of Students, 1941-1942.....	94
Scholarships.....	49	Medical Alumni Association.....	96
Loan Funds.....	52	Endowment Fund.....	96
Organization of the Curriculum.....	53	University of Maryland School of Nursing.....	97
Gross Anatomy.....	53	Mercy Hospital School of Nursing....	98
Histology and Embryology.....	54	Index of Names.....	99
Neuro-Anatomy.....	54		

CALENDAR

1942							1943							1944						
JULY							JANUARY							JULY						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
...	...	...	...	1	2	3	...	...	...	...	...	...	1	2	...	...	...	...	...	1
5	6	7	8	9	10	11	3	4	5	6	7	8	9	4	5	6	7	8	9	10
12	13	14	15	16	17	18	10	11	12	13	14	15	16	11	12	13	14	15	16	17
19	20	21	22	23	24	25	17	18	19	20	21	22	23	18	19	20	21	22	23	24
26	27	28	29	30	31	...	24	25	26	27	28	29	30	25	26	27	28	29	30	31
...	...	...	...	...	...	...	31	...	...	...	...	...	...	...	...	...	...	...	...	...
AUGUST							FEBRUARY							AUGUST						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
...	...	...	...	...	...	1	...	...	...	...	...	...	...	1	2	3	4	5	6	7
2	3	4	5	6	7	8	7	8	9	10	11	12	13	8	9	10	11	12	13	14
9	10	11	12	13	14	15	14	15	16	17	18	19	20	15	16	17	18	19	20	21
16	17	18	19	20	21	22	21	22	23	24	25	26	27	22	23	24	25	26	27	28
23	24	25	26	27	28	29	28	...	...	...	...	...	...	29	30	31	...	...	...	...
30	31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
SEPTEMBER							MARCH							SEPTEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1
6	7	8	9	10	11	12	7	8	9	10	11	12	13	5	6	7	8	9	10	11
13	14	15	16	17	18	19	14	15	16	17	18	19	20	12	13	14	15	16	17	18
20	21	22	23	24	25	26	21	22	23	24	25	26	27	19	20	21	22	23	24	25
27	28	29	30	...	...	...	28	29	30	31	...	...	...	26	27	28	29	30	31	...
OCTOBER							APRIL							OCTOBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1
4	5	6	7	8	9	10	4	5	6	7	8	9	10	3	4	5	6	7	8	9
11	12	13	14	15	16	17	11	12	13	14	15	16	17	10	11	12	13	14	15	16
18	19	20	21	22	23	24	18	19	20	21	22	23	24	17	18	19	20	21	22	23
25	26	27	28	29	30	31	25	26	27	28	29	30	...	24	25	26	27	28	29	30
...	...	...	...	...	...	...	...	...	...	...	...	...	...	31	...	...	...	...	...	...
NOVEMBER							MAY							NOVEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
1	2	3	4	5	6	7	...	...	...	...	...	...	...	...	...	...	...	...	...	1
8	9	10	11	12	13	14	2	3	4	5	6	7	8	7	8	9	10	11	12	13
15	16	17	18	19	20	21	9	10	11	12	13	14	15	14	15	16	17	18	19	20
22	23	24	25	26	27	28	16	17	18	19	20	21	22	21	22	23	24	25	26	27
29	30	...	...	...	...	...	23	24	25	26	27	28	29	28	29	30	31	...	...	...
...	...	...	...	...	...	...	30	31	...	...	...	...	...	...	...	...	...	...	...	...
DECEMBER							JUNE							DECEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1
6	7	8	9	10	11	12	6	7	8	9	10	11	12	5	6	7	8	9	10	11
13	14	15	16	17	18	19	13	14	15	16	17	18	19	12	13	14	15	16	17	18
20	21	22	23	24	25	26	20	21	22	23	24	25	26	19	20	21	22	23	24	25
27	28	29	30	31	...	...	27	28	29	30	...	...	...	26	27	28	29	30	...	...

CALENDAR—ACCELERATED PROGRAM SCHOOL OF MEDICINE

ACADEMIC YEAR—JUNE 25, 1942 to MARCH 25, 1943

1942

June 16-18

Re-examinations

FIRST SEMESTER

June 23	Tuesday	*Registration, Freshmen and Sophomores
June 24	Wednesday	*Registration, all other students
June 25	Thursday	Instruction begins
July 4	Saturday	Independence Day—Holiday
August 1	Saturday	Instruction suspended 2:00 P. M. Summer vacation
August 31	Monday	Instruction resumed
September 7	Monday	Labor Day—Holiday
November 7	Saturday	Instruction suspended 2:00 P. M.
November 9	Monday	Examinations, all classes, and *Registration for second semester
to		
November 14	Saturday	First semester completed at 12:30 P.M.

SECOND SEMESTER

November 16	Monday	Instruction resumed
November 26	Thursday	Thanksgiving Day—Holiday
November 27	Friday	Instruction resumed
December 23	Wednesday	Instruction suspended 5:00 P.M. Christmas Holidays
1943		
January 4	Monday	Instruction resumed
March 6	Saturday	Senior and Junior instruction ends 2:00 P.M.
March 8	Monday	Senior and Junior examinations begin
March 13	Saturday	Senior examinations completed Sophomore and Freshmen instruction ends 12 noon.
March 15	Monday	Junior examinations continue Sophomore and Freshmen examinations begin
March 20	Saturday	Announcement of graduates All examinations completed Second Semester completed 12:30 P.M.
March 25	Thursday	Graduation, in Baltimore.

PARTIAL CALENDAR—ACADEMIC YEAR—APRIL 8 TO DECEMBER 23, 1943

1943

March 30, 31	April 1	Re-examinations
April 6	Tuesday	*Registration, Freshmen and Sophomores
April 7	Wednesday	*Registration, all other students
April 8	Thursday	Instruction begins

* A student who fails to register prior to or within the day or days specified will be called upon to pay a late registration fee of five dollars (\$5.00). The last day of registration with fee added to regular charges is Saturday of the week in which registration begins.

The offices of the registrar and comptroller are open daily, not including Saturday, from 9:00 a.m. to 5:00 p.m., and Saturday from 9:00 a.m. to 12:30 p.m.

Early registration is encouraged.

CALENDAR—ACCELERATED PROGRAM SCHOOL OF MEDICINE

ACADEMIC YEAR—APRIL 8 TO DECEMBER 23, 1943

1943

March 30, 31	April 1	Re-examinations
FIRST SEMESTER		
April 6	Tuesday	*Registration, Freshmen and Sophomores
April 7	Wednesday	*Registration, all other students
April 8	Thursday	Instruction begins
April 23	Friday	Good Friday—Holiday
July 3	Saturday	Instruction Suspended, 2:00 P.M.
July 5	Monday	Independence Day, Holiday
July 6	Tuesday	Instruction resumed
July 26	Monday	Examinations, all classes
	to	*Registration, all classes
July 31	Saturday	First semester completed, 12:30 P.M.
August 2	to August 28	Summer vacation

SECOND SEMESTER

August 30	Monday	Instruction resumed
September 6	Monday	Labor Day—Holiday
November 25	Thursday	Thanksgiving Day—Holiday
November 26	Friday	Instruction resumed
December 4	Saturday	Senior and Junior instruction ends at 2:00 P.M.
December 6	Monday	Senior and Junior examinations begin
December 11	Saturday	Senior examinations completed
		Sophomore and Freshman instruction ends at 12 noon
December 13	Monday	Junior examinations continue
		Sophomore and Freshman examinations begin
December 18	Saturday	Announcement of graduates
		All examinations completed
		Second semester completed, 12:30 P.M.
December 23	Thursday	Graduation (date tentative)

PARTIAL CALENDAR—ACADEMIC YEAR— JANUARY 13 TO SEPTEMBER 30, 1944

1944

January 4, 5, 6		Re-examinations
January 11	Tuesday	*Registration, Freshmen and Sophomores
January 12	Wednesday	*Registration, all other students
January 13	Thursday	Instruction begins

* A student who fails to register prior to or within the day or days specified will be called upon to pay a late registration fee of five dollars (\$5.00). The last day of registration with fee added to regular charges is Saturday of the week in which registration begins.

The offices of the registrar and comptroller are open daily, not including Saturday, from 9:00 a.m. to 5:00 p.m., and Saturday from 9:00 a.m. to 12:30 p.m.

Early registration is encouraged.

ORGANIZATION

THE UNIVERSITY OF MARYLAND

HARRY CLIFTON BYRD, B.S., LL.D., D.Sc., *President and Executive Officer*

BOARD OF REGENTS

Term expires

HENRY HOLZAPFEL, JR., <i>Chairman</i>	1943
Hagerstown, Washington County	
MRS. JOHN L. WHITEHURST, <i>Secretary</i>	1947
4101 Greenway, Baltimore	
J. MILTON PATTERSON, <i>Treasurer</i>	1944
1015 Argonne Drive, Baltimore	
WILLIAM P. COLE, JR.....	1949
Towson, Baltimore County	
W. CALVIN CHESNUT.....	1942
Roland Park, Baltimore	
JOHN E. SEMMES.....	1942
100 W. University Parkway, Baltimore	
ROWLAND K. ADAMS.....	1948
1808 Fairbank Road, Baltimore	
PHILIP C. TURNER.....	1950
Parkton, Baltimore county	

The control of the University of Maryland is assigned to a Board of Regents appointed by the Governor and confirmed by the Senate for terms of nine years each. The general administration of the University is vested in the President. The University Council is an advisory body, composed of the President, the Director of the Agricultural Experiment Station, the Director of the Extension Service, and the Deans. The University Council acts upon all matters having relation to the University as a whole, or to co-operative work between the constituent groups. Each school has its own Faculty Council, composed of the Dean and members of its faculty; each Faculty Council controls the internal affairs of the group it represents.

The University has the following educational organizations:

At Baltimore

The School of Dentistry
The School of Law
The School of Medicine
The School of Nursing
The School of Pharmacy

At College Park

The College of Agriculture
The College of Arts and Sciences

The College of Commerce

The College of Education
The College of Engineering
The College of Home Economics
The Graduate School
The Department of Military
Science and Tactics
The Department of Physical
Education and Recreation
The Summer School

THE UNIVERSITY SENATE (Baltimore Schools)

H. C. BYRD, B.S., LL.D., D.Sc. President of the University
H. BOYD WYLIE, M.D. Acting Dean of the School of Medicine
ROGER HOWELL, Ph.D., LL.B. Dean of the School of Law
ANDREW G. DuMEZ, M.S., Ph.D. Dean of the School of Pharmacy
J. BEN ROBINSON, D.D.S., F.A.C.D. Dean of the School of Dentistry
L. B. BROUGHTON, Ph.D. Dean of the College of Arts and Sciences
*† JOHN E. SAVAGE, B.S., M.D. Acting Superintendent of the Hospital
ALMA H. PREINKERT, M.A. Registrar
EDGAR F. LONG, Ph.D. Acting Director of Admissions

FACULTY OF PHYSIC

EMERTI

J. FRANK CROUCH, M.D. . . . Professor of Clinical Ophthalmology and Otology, Emeritus
HARRY FRIEDENWALD, A.B., M.D., D.H.L., D.Sc. . Professor of Ophthalmology, Emeritus
WILLIAM S. GARDNER, M.D. Professor of Gynecology, Emeritus
§ JULIUS FRIEDENWALD, M.A., M.D. Professor of Gastro-Enterology, Emeritus
J. M. H. ROWLAND, M.D., D.Sc., LL.D.

Professor of Obstetrics, Emeritus; Dean, Emeritus

MEDICAL COUNCIL

H. BOYD WYLIE, *Acting Dean*

ARTHUR M. SHIPLEY	JOHN C. KRANTZ, JR.
HUGH R. SPENCER	*WALTER D. WISE
CARL L. DAVIS	J. MASON HUNDLEY, JR.
*MAURICE C. PINCOFFS	WILLIAM R. AMBERSON
FRANK W. HACHTEL	LOUIS H. DOUGLASS
EDUARD UHLENHUTH	*WALTER L. KILBY
CLYDE A. CLAPP	THOMAS P. SPRUNT

HENRY J. WALTON

PROFESSORS

ARTHUR M. SHIPLEY, M.D., Sc.D., Professor of Surgery.
HUGH R. SPENCER, M.D., Professor of Pathology.
H. BOYD WYLIE, M.D., Professor of Biological Chemistry and Acting Dean.
CARL L. DAVIS, M.D., Professor of Anatomy.
*MAURICE C. PINCOFFS, B.S., M.D., Professor of Medicine.

§ Died, June 8, 1941. † Resigned July 1, 1942.

On the lists of the Faculty of Physic and Fellows, and of the Hospital and Dispensary staffs, are given the names and positions assigned during the sessions 1941-1942 and 1942-1943, unless otherwise indicated. Interim changes are noted as follows:

* On leave, military service.

* Promotions effective 1942-1943. † Appointments effective 1942-1943.

‡ Resignations effective during or at the end of 1941-1942. § Deaths—Dates of.

- FRANK W. HACHTEL, M.D., Professor of Bacteriology.
 CLYDE A. CLAPP, M.D., Professor of Ophthalmology.
 EDUARD UHLENHUTH, Ph.D., Professor of Anatomy.
 JOHN C. KRANTZ, JR., Ph.D., Professor of Pharmacology.
 J. MASON HUNDLEY, JR., M.A., M.D., Professor of Gynecology.
 *WALTER D. WISE, M.D., Professor of Surgery.
 WILLIAM R. AMBERSON, Ph.D., Professor of Physiology.
 LOUIS H. DOUGLASS, M.D., Professor of Obstetrics.
 JOSEPH E. GICHNER, M.D., Professor of Clinical Medicine and Physical Therapeutics.
 IRVING J. SPEAR, M.D., Professor of Neurology.
 CHARLES F. BLAKE, M.A., M.D., Professor of Diseases of the Rectum and Colon.
 S. GRIFFITH DAVIS, M.S., M.D., Professor of Anaesthesia.
 G. CARROLL LOCKARD, M.D., Professor of Clinical Medicine.
 HARVEY G. BECK, M.D., D.Sc., Professor of Clinical Medicine.
 ALBERTUS COTTON, M.A., M.D., Professor of Orthopaedic Surgery and Roentgenology.
 ANDREW C. GILLIS, M.A., M.D., LL.D., Professor of Neurology.
 †HENRY J. WALTON, M.D., Professor of Roentgenology.
 ROSS McC. CHAPMAN, M.D., Professor of Psychiatry.
 EDGAR B. FRIEDENWALD, M.D., Professor of Clinical Pediatrics.
 EDWARD A. LOOPER, M.D., D.Oph., Professor of Diseases of the Nose and Throat.
 J. W. DOWNEY, M.D., Professor of Otolaryngology.
 W. H. TOULSON, M.Sc., M.D., Professor of Genito-Urinary Surgery.
 CHARLES BAGLEY, JR., M.A., M.D., Professor of Neurological Surgery.
 ALLEN FISKE VOSHELL, A.B., M.D., Professor of Orthopaedic Surgery.
 PAGE EDMUNDS, M.D., Professor of Traumatic Surgery.
 HARRY M. ROBINSON, SR., M.D., Professor of Dermatology.
 ELLIOTT H. HUTCHINS, M.A., M.D., Professor of Clinical Surgery.
 CHARLES REID EDWARDS, M.D., Professor of Clinical Surgery.
 F. L. JENNINGS, M.D., Professor of Clinical Surgery.
 HUNTINGTON WILLIAMS, M.D., Dr.P.H., Professor of Hygiene and Public Health.
 C. LORING JOSLIN, M.D., Professor of Pediatrics.
 *BRICE M. DORSEY, D.D.S., Professor of Oral Surgery.
 J. DAWSON REEDER, M.D., Professor of Diseases of the Rectum and Colon.
 THOMAS P. SPRUNT, A.B., M.D., Professor of Clinical Medicine.
 THOMAS B. AYCOCK, B.S., M.D., Professor of Clinical Surgery.
 *WALTER L. KILBY, M.D., Acting Professor of Roentgenology.
 COMPTON RIELY, M.D., Clinical Professor of Orthopaedic Surgery.
 M. RANDOLPH KAHN, M.D., Clinical Professor of Ophthalmology.
 WAITMAN F. ZINN, M.D., Clinical Professor of Diseases of the Nose and Throat.
 A. J. GILLIS, M.D., Clinical Professor of Genito-Urinary Surgery.
 THEODORE H. MORRISON, M.D., Clinical Professor of Gastro-Enterology.
 ABRAHAM S. SAMUELS, A.B., M.D., Clinical Professor of Gynecology.
 H. K. FLECK, M.D., Clinical Professor of Ophthalmology.
 *MONTE EDWARDS, M.D., Clinical Professor of Diseases of the Rectum and Colon
 *D. J. PESSAGNO, A.B., M.D., Clinical Professor of Surgery.
 KENNETH D. LEGGE, M.D., Clinical Professor of Genito-Urinary Surgery.
 *H. RAYMOND PETERS, A.B., M.D., Clinical Professor of Medicine.
 *THOMAS R. O'ROURK, M.D., Clinical Professor of Otolaryngology, Associate of Diseases of the
 Nose and Throat, and Assistant in Ophthalmology.

ASSOCIATE PROFESSORS

- R. W. LOCHER, M.D., Associate Professor of Clinical Surgery.
 T. NELSON CAREY, M.D., Associate Professor of Medicine and Physician in Charge of Medical Care of Students.
 HOWARD J. MALDEIS, M.D., Associate Professor of Medical Jurisprudence and Associate in Pathology.
 G. M. SETTLE, A.B., M.D., Associate Professor of Neurology and Clinical Medicine.
 THOMAS R. CHAMBERS, A.B., M.D., Associate Professor of Surgery.
 WILLIAM H. SMITH, M.D., Associate Professor of Clinical Medicine.
 PAUL W. CLOUGH, B.S., M.D., Associate Professor of Medicine.
 SYDNEY R. MILLER, B.S., M.D., Associate Professor of Medicine.
 J. MCFARLAND BERGLAND, B.S., M.D., Associate Professor of Obstetrics.
 WALTER A. BAETJER, A.B., M.D., Associate Professor of Medicine.
 EDWARD S. JOHNSON, M.D., Associate Professor of Surgery.
 EMIL NOVAK, A.B., M.D., D.Sc., Associate Professor of Obstetrics.
 RALPH P. TRUITT, M.D., Associate Professor of Psychiatry.
 MOSES GELLMAN, B.S., M.D., Associate Professor of Orthopaedic Surgery.
 HARRY L. ROGERS, M.D., Associate Professor of Orthopaedic Surgery.
 O. G. HARNE, Associate Professor of Histology.
 CHARLES A. REIFSCHNEIDER, M.D., Associate Professor of Traumatic Surgery and Oral Surgery.
 FRANK H. J. FIGGE, Ph.D., Associate Professor of Gross Anatomy.
 *WM. S. LOVE, JR., A.B., M.D., Associate Professor of Medicine and Instructor in Pathology.
 RAYMOND HUSSEY, M.A., M.D., Associate Professor of Medicine.
 *LOUIS A. M. KRAUSE, M.D., Associate Professor of Medicine.
 N. CLYDE MARVEL, A.B., M.D., Associate Professor of Surgery.
 *T. CAMPBELL GOODWIN, M.S., M.D., Associate Professor of Pediatrics.
 *CARL DAME CLARKE, M.A., Associate Professor of Art as Applied to Medicine.
 EMIL G. SCHMIDT, Ph.D., LL.B., Associate Professor of Biological Chemistry.
 LAWRENCE F. WOOLLEY, M.D., Associate Professor of Psychiatry.
 RICHARD G. COBLENTZ, M.A., M.D., Associate Professor of Neurological Surgery.
 GRANT E. WARD, A.B., M.D., Associate Professor of Surgery and Oral Surgery.
 DIETRICH CONRAD SMITH, Ph.D., Associate Professor of Physiology.
 FRANKLIN B. ANDERSON, M.D., Associate Professor of Diseases of the Nose and Throat and Otology.
 LEON FREEDOM, M.D., Associate Professor of Neurology and Instructor in Pathology.
 JAMES G. McALPINE, Ph.D., Associate Professor of Bacteriology.
 C. JELLEFF CARR, Ph.D., Associate Professor of Pharmacology.
 CYRUS F. HORINE, M.D., Associate Professor of Surgery.
 ROBERT B. WRIGHT, B.S., M.D., Associate Professor of Pathology.
 C. GARDNER WARNER, A.B., M.D., Associate Professor of Pathology.
 WILLIAM E. HAHN, D.D.S., Associate Professor of Oral Surgery.
 VERNON D. KAUFMAN, D.D.S., Associate Professor of Oral Surgery.

ASSISTANT PROFESSORS

- GEORGE McLEAN, M.D., Assistant Professor of Medicine.
 MAURICE FELDMAN, M.D., Assistant Professor of Gastro-Enterology.
 JOHN H. TRABAND, M.D., Assistant Professor of Pediatrics.

- ALBERT JAFFE, M.D., Assistant Professor of Pediatrics.
 ★HARRY GOLDSMITH, M.D., Assistant Professor of Psychiatry.
 ★H. W. NEWELL, M.D., Assistant Professor of Psychiatry.
 ZACHARIAH MORGAN, M.D., Assistant Professor of Gastro-Enterology.
 SAMUEL MORRISON, A.B., M.D., Assistant Professor of Gastro-Enterology.
 HARRY M. MURDOCK, B.S., M.D., Assistant Professor of Psychiatry.
 A. H. FINKELSTEIN, M.D., Assistant Professor of Pediatrics.
 JOHN E. LEGGE, M.D., Assistant Professor of Medicine.
 THOMAS C. WOLFF, LITT.B., M.D., C.M., Assistant Professor of Medicine.
 FREDERICK B. SMITH, M.D., Assistant Professor of Pediatrics.
 J. G. M. REESE, M.D., Assistant Professor of Obstetrics.
 M. ALEXANDER NOVEY, A.B., M.D., Assistant Professor of Obstetrics.
 THOMAS K. GALVIN, M.D., Assistant Professor of Gynecology.
 LEO BRADY, A.B., M.D., Assistant Professor of Gynecology.
 R. G. WILLSE, M.D., Assistant Professor of Gynecology.
 GEORGE A. STRAUSS, JR., M.D., Assistant Professor of Gynecology.
 ROBERT H. OSTER, Ph.D., Assistant Professor of Physiology.
 H. M. BUBERT, M.D., Assistant Professor of Medicine.
 ★WALTER C. MERKEL, A.B., M.D., Assistant Professor of Pathology.
 JOHN F. LUTZ, A.B., M.D., Assistant Professor of Histology.
 BENJAMIN PUSHKIN, M.D., Assistant Professor of Neurology.
 WILLIAM ELLSWORTH EVANS, Ph.D., Assistant Professor of Pharmacology.
 H. F. BONGARDT, M.D., Assistant Professor of Surgery.
 J. EDMUND BRADLEY, B.S., M.D., Assistant Professor of Pediatrics.
 ★GEORGE H. YEAGER, B.S., M.D., Assistant Professor of Surgery.
 ISADORE A. SIEGEL, A.B., M.D., Assistant Professor of Obstetrics.
 WILLIAM H. F. WARTHEN, A.B., M.D., Assistant Professor of Hygiene and Public Health.
 FRANCIS ELLIS, A.B., M.D., Assistant Professor of Dermatology.
 EDWARD P. SMITH, M.D., Assistant Professor of Gynecology.
 J. S. EASTLAND, A.B., M.D., Assistant Professor of Medicine.
 ★HENRY F. ULLRICH, M.D., D.Sc., Assistant Professor of Orthopaedic Surgery.
 ★D. JAMES GREINER, B.S., M.D., Assistant Professor of Pathology.
 JAMES C. PLAGGE, Ph.D., Assistant Professor of Gross Anatomy.
 MILTON S. SACKS, B.S., M.D., Assistant Professor of Medicine, Instructor in Pathology,
 and ‡Assistant in Bacteriology.
 ROSS DAVIES, M.D., M.P.H., Assistant Professor of Hygiene and Public Health.
 J. HERBERT WILKERSON, M.D., Assistant Professor of Oral Surgery.
 ★LEWIS P. GUNDRY, A.B., M.D., Assistant Professor of Medicine.
 ★HENRY F. GRAFF, A.B., M.D., Assistant Professor of Ophthalmology.
 †WALTER L. HARD, A.B., Ph.D., Assistant Professor of Histology.
 †GLENN S. WEILAND, Ph.D., Assistant Professor of Biological Chemistry.

LECTURERS

- JONAS FRIEDENWALD, M.A., M.D., Lecturer in Ophthalmic Pathology.
 E. B. FREEMAN, B.S., M.D., Lecturer in Medicine.
 CHARLES R. GOLDSBOROUGH, M.A., M.D., Lecturer in Medicine.
 W. N. BISPHAM, Col., M.C., U. S. A. (ret.), Lecturer in Medicine
 LESLIE B. HOHMAN, M.D., Lecturer in Psychiatry.
 †CLARK H. YEAGER, M.D., Dr.P.H., Lecturer in Tropical Medicine.

ASSOCIATES

- JOHN R. ABERCROMBIE, A.B., M.D., Associate in Dermatology.
 JOSEPH I. KEMLER, M.D., Associate in Ophthalmology.
 FRANK N. OGDEN, M.D., Associate in Biological Chemistry.
 AUSTIN H. WOOD, M.D., Associate in Genito-Urinary Surgery.
 ALBERT E. GOLDSTEIN, M.D., Associate in Pathology.
 SAMUEL S. GLICK, M.D., Associate in Pediatrics.
 CLEWELL HOWELL, B.S., M.D., Associate in Pediatrics.
 JOSEPH SINDLER, M.D., Associate in Gastro-Enterology.
 I. O. RIDGLEY, M.S., M.D., Associate in Surgery.
 †R. D. WEST, M.D., Associate in Ophthalmology.
 †EUGENE L. FLIPPIN, M.D., Associate in Roentgenology.
 L. J. MILLAN, M.D., Associate in Genito-Urinary Surgery.
 W. RAYMOND MCKENZIE, M.D., Associate in Diseases of the Nose and Throat.
 L. K. FARGO, M.D., Associate in Genito-Urinary Surgery.
 †HAROLD M. GOODMAN, A.B., M.D., Associate in Dermatology.
 WETHERBEE FORT, M.D., Associate in Medicine.
 F. STRATNER OREM, M.D., Associate in Pediatrics.
 FRANK J. GERAGHTY, A.B., M.D., Associate in Medicine.
 JOHN F. HOGAN, M.D., Associate in Genito-Urinary Surgery.
 ★KENNETH B. BOYD, M.D., Associate in Gynecology and Assistant in Obstetrics.
 JOHN T. HIBBITS, M.D., Associate in Gynecology.
 E. H. TONOLLA, M.D., Associate in Medicine.
 C. W. PEAKE, M.D., Associate in Surgery.
 W. A. H. COUNCILL, M.D., Associate in Genito-Urinary Surgery.
 Z. VANCE HOOPER, M.D., Associate in Gastro-Enterology.
 FRANK B. KINDELL, A.B., M.D., Associate in Pathology.
 WILLIAM M. SEABOLD, A.B., M.D., Associate in Pediatrics.
 BENJAMIN S. RICH, A.B., M.D., Associate in Otolaryngology and in Diseases of the Nose and Throat.
 ★JOHN E. SAVAGE, B.S., M.D., Associate in Obstetrics and †Assistant in Pathology.
 ★THOMAS J. COONAN, A.B., M.D., Associate in Pediatrics.
 *E. EUGENE COVINGTON, M.D., Associate in Surgery.
 EDWARD A. KITLOWSKI, M.D., Associate in Plastic Surgery.
 G. BOWERS MANSORFER, B.S., M.D., Associate in Pediatrics.
 SOL SMITH, M.D., Associate in Medicine.
 ★HENRY V. LANGELOTTIG, A.B., M.D., Associate in Medicine.
 JAMES W. NELSON, M.D., Associate in Surgery.
 ★I. RIDGEWAY TRIMBLE, M.D., Associate in Surgery.
 ★RICHARD T. SHACKELFORD, A.B., M.D., Associate in Surgery.
 ★SIMON H. BRAGER, M.D., Associate in Surgery.
 RAYMOND F. HELFRICH, A.B., M.D., Associate in Surgery.
 ★HARRY S. SHELLEY, B.S., M.D., Associate in Genito-Urinary Surgery.
 ★HARRY C. HULL, M.D., Associate in Surgery.
 ★HARRY M. ROBINSON, JR., B.S., M.D., Associate in Dermatology, Assistant in Medicine.
 OTTO C. BRANTIGAN, B.S., M.D., Associate in Surgery and Gross Anatomy.
 FRANCIS W. GILLIS, M.D., Associate in Genito-Urinary Surgery.
 ★JOHN C. DUMLER, B.S., M.D., Associate in Gynecology.
 BEVERLEY C. COMPTON, A.B., M.D., Associate in Gynecology.

HOUSTON EVERETT, M.D., Associate in Gynecology.
 MARGARET B. BALLARD, M.D., Associate in Obstetrics.
 DUDLEY P. BOWE, A.B., M.D., Associate in Obstetrics.
 CLEO D. STILES, M.D., Associate in Diseases of the Nose and Throat, and Assistant in Otolaryngology.
 †CHARLES H. DAVIDSON, M.D., Associate in Roentgenology.
 *F. EDWIN KNOWLES, JR., M.D., Associate in Ophthalmology.

INSTRUCTORS

*HENRY F. BUETTNER, M.D., Instructor in Bacteriology.
 M. S. KOPPELMAN, M.D., Instructor in Gastro-Enterology.
 MYRON G. TULL, A.B., M.D., Instructor in Hygiene and Public Health.
 WILLIAM R. JOHNSON, M.D., Instructor in Surgery.
 E. M. HANRAHAN, A.B., M.D., Instructor in Surgery.
 RUTH MUSSER, M.S., Instructor in Pharmacology.
 BENJAMIN ABESHOUSE, Ph.B., M.D., Instructor in Pathology.
 S. DEMARCO, M.D., Instructor in Surgery.
 *KARL J. STEINMUELLER, A.B., M.D., Instructor in Surgery.
 *SAMUEL T. HELMS, B.S., M.D., Instructor in Medicine and Genito-Urinary Surgery.
 *F. A. HOLDEN, M.D., Instructor in Ophthalmology.
 EARL L. CHAMBERS, M.D., Instructor in Medicine.
 *M. PAUL BYERLY, M.D., Instructor in Pediatrics.
 LUTHER E. LITTLE, M.D., Instructor in Surgery.
 J. FRANK HEWITT, A.B., M.D., Instructor in Surgery.
 DAVID TENNER, M.D., Instructor in Medicine.
 *R. B. MITCHELL, JR., B.S., M.D., Instructor in Medicine.
 SAMUEL LEGUM, A.B., M.D., Instructor in Medicine.
 ERNEST LEVI, M.D., Instructor in Gastro-Enterology.
 ERNEST S. EDLOW, A.B., M.D., Instructor in Gynecology.
 THOMAS S. BOWYER, A.B., M.D., Instructor in Gynecology.
 ‡JOSEPH V. CASTAGNA, M.D., Instructor in Gynecology.
 M. S. SHILING, A.B., M.D., D.Sc., Instructor in Medicine.
 ROBERT W. GARIS, A.B., M.D., Instructor in Medicine.
 PHILIP F. LERNER, A.B., M.D., Instructor in Neurology.
 H. EDMUND LEVIN, B.S., M.D., Instructor in Medicine and Bacteriology.
 *CONRAD B. ACTON, B.S., M.D., Instructor in Medicine and Assistant in Pathology.
 ROBERT A. REITER, A.B., M.D., Instructor in Medicine.
 W. GRAFTON HERSPERGER, A.B., M.D., Instructor in Medicine.
 MEYER W. JACOBSON, M.D., Instructor in Medicine.
 *HUGH G. WHITEHEAD, M.D., Instructor in Medicine.
 PHILIP D. FLYNN, M.D., Instructor in Medicine.
 ALBERT J. SHOCHAT, B.S., M.D., Instructor in Gastro-Enterology.
 *JEROME FINEMAN, M.D., Instructor in Pediatrics.
 BERNHARD BADT, M.D., Instructor in Neurology.
 *WILLIAM L. FEARING, M.D., Instructor in Neurology.
 *FRANK K. MORRIS, A.B., M.D., Instructor in Gynecology and ‡Obstetrics.
 *B. MATTHEW DEBUSKEY, M.D., Instructor in Pediatrics.
 *A. RUSSELL ANDERSON, M.D., Instructor in Psychiatry.
 JAMES C. OWINGS, M.D., Instructor in Diseases of the Rectum and Colon.
 *EDWARD S. KALLINS, B.S., M.D., Instructor in Medicine.

W. ALLEN DECKERT, A.B., M.D., Instructor in Gynecology and Assistant in Surgery and Obstetrics.

*MURRAY M. COPELAND, M.D., Instructor in Surgery.

J. DUER MOORES, B.S., M.D., Instructor in Surgery.

*PHILIP S. WAGNER, M.D., Instructor in Psychiatry.

*IRVING FREEMAN, B.S., M.D., Instructor in Medicine.

HUGH B. McNALLY, B.S., M.D., Instructor in Obstetrics.

JOHN A. MYERS, M.E.E., M.D., Instructor in Medicine, Assistant in Gastro-Enterology.

*EDWARD F. COTTER, M.D., Instructor in Pathology, Assistant in Neurology.

KURT LEVY, M.D., Instructor in Medicine.

THURSTON R. ADAMS, M.D., Instructor in Surgery.

HENRY L. WOLLENWEBER, M.D., Instructor in Pathology, †Assistant in Pharmacology.

*WILLIAM G. HELFRICH, B.S., M.D., Instructor in Medicine.

*HOWARD B. MAYS, M.D., Instructor in Genito-Urinary Surgery and Assistant in Pathology.

*ARTHUR G. SIWINSKI, A.B., M.D., Instructor in Surgery.

*LESTER N. KOLMAN, M.D., Instructor in Dermatology.

*GIBSON J. WELLS, A.B., M.D., Instructor in Pediatrics.

*HARRY A. TEITELBAUM, B.S., M.D., †Instructor in Gross Anatomy, Assistant in Neurology.

*ERNEST I. CORNBROOKS, JR., A.B., M.D., Instructor in Gynecology.

*FRANCIS G. DICKEY, A.B., M.D., Instructor in Medicine.

*HERBERT E. REIFSCHNEIDER, A.B., M.D., Instructor in Oral Surgery and Assistant in Surgery.

WILLIAM B. SETTLE, M.D., Instructor in Gynecology.

ROBERT L. GRAHAM, A.B., M.D., Instructor in Pathology.

CONRAD L. INMAN, D.D.S., Instructor in Oral Surgery.

*B. WALLACE INMAN, D.D.S., Instructor in Oral Surgery.

DORSEY R. TIPTON, D.D.S., Instructor in Oral Surgery.

I. H. MASERITZ, M.D., Instructor in Orthopaedic Surgery.

*MILTON C. LANG, M.D., Instructor in Ophthalmology.

*C. EDWARD LEACH, M. D., Instructor in Medicine.

*DAVID HOLLANDER, A.B., M.D., Instructor in Pathology.

†EDWARD G. BOETTIGER, Ph.D., Instructor in Physiology.

†JOHN A. WAGNER, M.D., Instructor in Pathology.

†A. KREMEN, A.B., M.D., Instructor in Ophthalmology.

†LAWRENCE M. SERRA, M.D., Instructor in Medicine.

†CHARLES SCHMIDT, M.D., Instructor in Psychiatry.

†WILSON GRUBB, M.D., Instructor in Pediatrics.

†ANN VIRGINIA BROWN, A.B., Instructor in Biological Chemistry.

†JAMES G. ARNOLD, M.D., Instructor in Neurological Surgery.

†CALVIN HYMAN, M.D., Instructor in Surgery.

†THURSTON R. ADAMS, M.D., Instructor in Diseases of the Rectum and Colon.

ASSISTANTS

WILLIAM R. GERAGHTY, B.S., M.D., Assistant in Surgery.

*JAROSLAV HULLA, M.D., Assistant in Obstetrics.

MARIUS P. JOHNSON, A.B., M.D., Assistant in Pharmacology and †Obstetrics.

HOWARD B. McELWAIN, M.D., Assistant in Surgery.

A. V. BUCHNESS, A.B., M.D., Assistant in Surgery.

T. J. TOUHEY, M.D., Assistant in Surgery.

W. J. SCHMITZ, M.D., Assistant in Pediatrics.
 ‡JOHN G. RUNKLE, M.D., Assistant in Ophthalmology.
 CLYDE F. KARNS, B.S., M.D., Assistant in Surgery.
 MORRIS FINE, M.D., Assistant in Medicine.
 SAMUEL H. CULVER, M.D., Assistant in Surgery.
 ★W. H. TRIPLETT, M.D., Assistant in Medicine.
 E. HOLLISTER DAVIS, A.B., M.D., Assistant in Anaesthesia.
 ★ISRAEL P. MERANSKI, B.S., M.D., Assistant in Pediatrics.
 ALBERT R. WILKERSON, M.D., Assistant in Surgery.
 H. WHITNEY WHEATON, M.D., Assistant in Pediatrics.
 ★LAURISTON L. KEOWN, A.B., M.D., Assistant in Pediatrics.
 L. T. CHANCE, M.D., Assistant in Surgery.
 SAMUEL McLANAHAN, JR., A.B., M.D., Assistant in Surgery.
 ★SAMUEL E. PROCTOR, A.B., M.D., Assistant in Surgery.
 GEORGE GOVATOS, A.B., M.D., Assistant in Surgery.
 JEROME SNYDER, B.S., M.D., Assistant in Ophthalmology.
 WILLIAM H. GRENZER, M.D., Assistant in Medicine.
 ★GEORGE SILVERTON, A.B., M.D., Assistant in Medicine.
 DWIGHT M. CURRIE, A.B., M.D., Assistant in Surgery.
 ROLLIN C. HUDSON, M.D., Assistant in Dermatology.
 MAXWELL L. MAZER, M.D., Assistant in Obstetrics.
 ★JOSEPH M. BLUMBERG, B.S., M.D., Assistant in Medicine and Obstetrics.
 ★FERD. E. KADAN, A.B., M.D., Assistant in Obstetrics.
 ★LAWRENCE KATZENSTEIN, M.D., Assistant in Medicine.
 LEON ASHMAN, M.D., Assistant in Medicine.
 NATHANIEL M. BECK, A.B., M.D., Assistant in Medicine and Gastro-Enterology.
 ‡CHARLES E. BALFOUR, M.D., Assistant in Neurology.
 ROBERT F. HEALY, M.D., Assistant in Surgery.
 HERBERT M. FOSTER, M.D., Assistant in Surgery.
 DANIEL R. ROBINSON, M.D., Assistant in Surgery.
 ★H. L. GRANOFF, A.B., M.D., Assistant in Gynecology.
 J. J. ERWIN, M.D., Assistant in Gynecology.
 ISRAEL ROSEN, A.B., M.D., Assistant in Pediatrics.
 WILLIAM GREENFELD, M.D., Assistant in Gastro-Enterology.
 ★S. EDWIN MULLER, M.D., Assistant in Medicine.
 SAMUEL SNYDER, M.D., Assistant in Medicine.
 PAUL E. CARLINER, B.S., M.D., Assistant in Medicine.
 ★WILLIAM A. PARR, M.D., Assistant in Otology.
 JEANNETTE R. HEGHINIAN, B.S., M.D., Assistant in Dermatology.
 ★JOSEPH V. JERARDI, B.S., M.D., Assistant in Surgery.
 ROBERT F. CHENOWITH, M.D., Assistant in Surgery.
 ★JACOB R. JENSEN, B.S., M.D., Assistant in Obstetrics.
 J. EDWARD NORRIS, M.D., Assistant in Obstetrics.
 ★J. WARREN ALBRITAIN, B.S., M.D., Assistant in Obstetrics.
 KARL F. MECH, B.S., M.D., Assistant in Pathology.
 JOYE E. JACOBS, A.B., Assistant in Physiology.
 LOUIS J. KROLL, A.B., M.D., Assistant in Medicine.
 ★SAMUEL T. R. REVELL, B.S., M.D., Assistant in Medicine.
 ★HUGH JEWETT, M.D., Assistant in Genito-Urinary Surgery.
 JOHN V. HOPKINS, M.D., Assistant in Orthopaedic Surgery.

- †ELDRED ROBERTS, B.S., M.D., Assistant in Surgery.
 *JOHN L. ATKINS, A.B., M.D., Assistant in Medicine.
 *JOHN W. MACHEN, M.D., Assistant in Neurology.
 DONALD B. GROVE, M.D., Assistant in Surgery.
 *WILLIAM S. CHENEY, M.D., Assistant in Surgery.
 GEORGE H. DAVIS, M.D., Assistant in Obstetrics.
 F. A. KAYSER, M.D., Assistant in Diseases of the Nose and Throat.
 *THEODORE A. SCHWARTZ, M.D., Assistant in Diseases of the Nose and Throat.
 *HARRY C. BOWIE, B.S., M.D., Assistant in Surgery and Gross Anatomy.
 D. MCCLELLAN DIXON, M.D., Assistant in Obstetrics.
 *EPHRAIM T. LISANSKY, A.B., M.D., Assistant in Pathology and Medicine.
 *WILLIAM K. WALLER, A.B., M.D., Assistant in Medicine.
 ROBERT J. GORE, M.D., Assistant in Pediatrics.
 *EARLE S. SCOTT, M.D., Assistant in Pediatrics.
 NACHMAN DAVIDSON, A.B., M.D., Assistant in Medicine.
 *WILLIAM M. GARLICK, A.B., M.D., Assistant in Surgery.
 *GEORGE H. BROUILLET, B.S., M.D., Assistant in Pathology.
 *BENJAMIN HIGHSTEIN, M.D., Assistant in Dermatology.
 *MARK HOLLANDER, M.D., Assistant in Dermatology.
 *W. KENNETH MANSFIELD, JR., M.D., Assistant in Obstetrics.
 BERNARD W. DONAHUE, M.D., Assistant in Obstetrics.
 †RICHARD N. TILLMAN, M.D., Assistant in Medicine.
 †ARNOLD F. LAVENSTEIN, M.D., Assistant in Pediatrics.
 †WILLIAM EARL WEEKS, M.D., Assistant in Pediatrics.
 †DONALD J. ROOP, M.D., Assistant in Pediatrics.
 †VERNON E. KRAHL, B.S., M.S., Assistant in Gross Anatomy.
 †LESLIE HARRELL PIERCE, B.S., M.D., Assistant in Medicine.
 †H. PEARCE MACCUBBIN, B.S., M.D., Assistant in Medicine.
 †WILFRED H. TOWNSEND, JR., A.B., M.D., Assistant in Medicine.
 *†EDWARD L. FREY, JR., A.B., M.D., Assistant in Medicine.
 †WILLIAM C. LOWE, B.S., M.D., Assistant in Medicine.
 †THOMAS A. HEDRICK, M.D., Assistant in Medicine.
 *†FREDERICK W. WAKNITZ, M.D., Assistant in Surgery.
 †WILLIAM B. SETTLE, M.D., Assistant in Surgery.
 †CLARENCE P. SCARBOROUGH, M.D., Assistant in Surgery.
 *†WILLIAM C. HUMPHRIES, M.D., Assistant in Diseases of the Nose and Throat.
 †SOLOMON TANENBAUM, M.D., Assistant in Dermatology.
 †JASON H. GASKELL, M.D., Assistant in Orthopedic Surgery.
 †RICHARD S. OWENS, M.D., Assistant in Otology.
 †HAROLD H. BURNS, M.D., Assistant in Surgery.
 *†DANIEL I. DANN, M.D., Assistant in Obstetrics.
 †D. FRANK KALTREIDER, M.D., Assistant in Obstetrics.
 †HELEN I. MAGINNIS, M.D., Assistant in Gynecology.
 *†ARTHUR KARFGIN, B.S., M.D., Assistant in Medicine.
 *†JOSEPH E. MUSE, JR., B.S., M.D., Assistant in Medicine.
 †DANIEL WILFSON, JR., A.B., M.D., Assistant in Medicine.
 †JOSEPH B. GROSS, B.S., M.D., Assistant in Medicine.
 †SAMUEL J. HANKIN, M.D., Assistant in Medicine.
 †ANTHONY F. CAROZZA, M. D., Assistant in Medicine.
 *†STUART G. COUGHLAN, B.S., M.D., Assistant in Surgery.
 *†WILLIAM B. LONG, JR., B.S., M.D., Assistant in Orthopaedic Surgery.

- ★†ROBERT C. CRAWFORD, A.B., M.D., Assistant in Medicine.
- ★†EVERETT S. DIGGS, B.S., M.D., Assistant in Gynecology.
- ★†CHARLES W. KNERLER, M.D., Assistant in Medicine.
- ★†ERNEST W. MACK, M.D., Assistant in Surgery.
- ★†HUGH H. TROUT, JR., M.D., Assistant in Surgery.
- ★†MARION H. GILLIS, M.D., Assistant in Ophthalmology.
- ★†CHARLES W. REAVIS, M.D. Assistant in Roentgenology.
- ★†HENRY L. RIGDON, M.D., Assistant in Surgery.
- ★†OLIVER A. JAMES, M.D., Assistant in Surgery.
- ★†J. KING B. E. SEEGAR, A.B., M.D., Assistant in Obstetrics.
- ★†EDWIN O. DAUE, JR., B.S., M.D., Assistant in Medicine.
- ★†ROBERT L. GIBBS, A.B., M.D., Assistant in Medicine.
- ★†JAMES R. KARNS, B.S., M.D., Assistant in Medicine.
- ★†ROBERT B. MEARNs, M.D., Assistant in Medicine.
- ★†WILLIAM W. MCKINNEY, M.D., Assistant in Neurological Surgery.
- †BENEDICT SKITARELIC, A.B., M.D., Assistant in Pathology.

FELLOWS AND RESEARCH ASSOCIATES

- FREDERICK K. BELL, Ph.D., U. S. Pharmacopoeia Fellow.
- SYLVAN E. FORMAN, Ph.D., Fellow in Pharmacology.
- SIDNEY BERMAN, M.D., Fellow in Psychiatry.
- ★FREDERICK J. VOLLMEYER, B.S., M.D., Hitchcock Fellow in Medicine.
- ★HARRY C. BOWIE, B.S., M.D., Weaver Fellow in Gross Anatomy.
- GUY M. EVERETT, B.S., Weaver Fellow in Physiology.
- †NORMAN PINSCHMIDT, M.S., Fellow in Pharmacology.
- †MARJORIE RUPPERSBERGER, B.S., Fellow in Pharmacology.
- †JOHN A. WAGNER, B.S., M.D., Hitchcock Fellow in Neurosurgery.
- †WILLIAM K. DIEHL, B.S., M.D., Hitchcock Fellow in Gynecology.
- †DEXTER L. REIMANN, B.S., M.D., Weaver Fellow in Pathology.
- †RUTH M. BISHOP, A.B., Fellow in Pharmacology.
- †EDITH J. WIEGAND, A.B., Fellow in Pharmacology.
- †MILTON L. SOLOMON, B.S., M.D., Research Associate in Gross Anatomy.

UNIVERSITY HOSPITAL COUNCIL

HARRY CLIFTON BYRD, *President.*
H. BOYD WYLIE, *Acting Dean of the School of Medicine.*
THOMAS P. SPRUNT, *Acting Head of the Department of Medicine.*
A. M. SHIPLEY, *Head of the Department of Surgery.*
J. MASON HUNDLEY, JR., *Head of the Department of Gynecology.*
LOUIS H. DOUGLASS, *Head of the Department of Obstetrics.*
CLYDE A. CLAPP, *Head of the Department of Ophthalmology.*
‡JOHN E. SAVAGE, *Acting Superintendent of the Hospital.*
MISS ANNIE CRIGHTON, R.N., *Superintendent of Nurses.*
MRS. R. B. PUE, *Representing Woman's Auxiliary Board.*
RALPH P. TRUITT } *Representing Hospital Staff.*
THOMAS B. AYCOCK }
GEORGE F. SARGENT } *Representing Medical Alumni.*
ALFRED T. GUNDRY }

UNIVERSITY HOSPITAL STAFF

‡JOHN E. SAVAGE, *Acting Superintendent*

<i>Physician-in-Chief</i>	★MAURICE C. PINCOFFS
<i>Acting Physician-in-Chief</i>	THOMAS P. SPRUNT
	{ WALTER A. BAETJER
	{ THOMAS P. SPRUNT
	{ JOHN E. LEGGE
<i>Physicians</i>	{ ★LOUIS A. M. KRAUSE
	{ G. CARROLL LOCKARD
	{ JOSEPH E. GICHNER
	{ WILLIAM H. SMITH
	{ ★WILLIAM S. LOVE, JR.
	{ T. NELSON CAREY
<i>Gastro-Enterologist</i>	{ RAYMOND HUSSEY
	{ ZACHARIAH R. MORGAN
<i>Neurologists</i>	{ IRVING J. SPEAR
	{ GEORGE M. SETTLE
	{ LEON FREEDOM
<i>Psychiatrists</i>	{ ROSS MCC. CHAPMAN
	{ RALPH P. TRUITT
	{ HARRY M. MURDOCK
<i>Pediatricians</i>	{ C. LORING JOSLIN
	{ ALBERT JAFFE
	{ J. E. BRADLEY
<i>Pathologist</i>	HUGH R. SPENCER
<i>Surgeon-in-Chief</i>	ARTHUR M. SHIPLEY
<i>Surgeons</i>	{ CHARLES REID EDWARDS
	{ PAGE EDMUNDS
	{ THOMAS B. AYCOCK

‡Resigned July 1, 1942.

<i>Neurological Surgeons</i>	{ CHARLES BAGLEY, JR. RICHARD G. COBLENTZ EDWARD A. LOOPER
<i>Laryngologists</i>	{ FRANKLIN B. ANDERSON THOMAS R. O'ROURK
<i>Proctologists</i>	{ J. DAWSON REEDER ★MONTE EDWARDS
<i>Orthopaedic Surgeons</i>	{ ALLEN FISKE VOSHELL MOSES GELLMAN COMPTON RIELY ★HENRY F. ULLRICH
<i>Genito-Urinary Surgeons</i>	{ W. H. TOULSON. W. A. H. COUNCILL LYLE J. MILLAN ★HARRY S. SHELLEY ★HOWARD B. MAYS
<i>Roentgenologists</i>	{ HENRY J. WALTON ★WALTER L. KILBY CHARLES N. DAVIDSON
<i>Dermatologist</i>	HARRY M. ROBINSON, SR.
<i>Bronchoscopist</i>	EDWARD A. LOOPER
<i>Otologist</i>	J. W. DOWNEY, JR.
<i>Anaesthetists</i>	{ S. GRIFFITH DAVIS E. HOLLISTER DAVIS MARY J. O'BRIEN, R.N. RUTH ELLIOTT, R.N. ROSE L. FURLONG, R.N.
<i>Obstetricians</i>	{ L. H. DOUGLASS M. A. NOVEY ISADORE A. SIEGEL J. G. M. REESE ★JOHN E. SAVAGE
<i>Ophthalmologists</i>	{ CLYDE A. CLAPP WILLIAM TARUN HENRY F. GRAFF
<i>Gynecologists</i>	{ J. M. HUNDLEY, JR. LEO BRADY BEVERLEY C. COMPTON
<i>Oncologists</i>	{ J. M. HUNDLEY, JR. GRANT E. WARD

ANNUAL HOSPITAL APPOINTMENTS

The following annual appointments are made from among the graduates of the school to the University Hospital:

Seven Residents in Surgery
Four Residents in Medicine
Four Residents in Obstetrics
Two Residents in Gynecology
Three Residents in Pediatrics

Resident in Nose & Throat
Three Residents in Roentgenology
Twelve Senior Internes rotating in
Medicine and Surgery
Twelve Junior Internes rotating in the
Specialties

UNIVERSITY HOSPITAL RESIDENT AND INTERN STAFF

JULY 1, 1941 – JUNE 30, 1942

RESIDENT STAFF

★STUART G. COUGHLAN, B.S., M.D., *Resident Surgeon.*
JOHN H. HAASE, M.D., *Assistant Resident Surgeon.*
ROBERT C. SHEPPARD, M.D., *Assistant Resident Surgeon.*
HENRY A. BRIELE, M.D., *Assistant Resident Surgeon.*
RAYMOND CUNNINGHAM, A.B., M.D., *Assistant Resident Surgeon.*
PHILIP L. SMOAK, M.D., *Assistant Resident Surgeon.*
JAMES G. ARNOLD, JR., A.B., M.D., *Assistant Resident Surgeon assigned to Neuro-Surgery.*
LAWRENCE S. CANNON, A.B., M.D., *Assistant Resident Surgeon assigned to Neuro-Surgery.*
RICHARD S. OWENS, JR., M.D., *Assistant Resident Surgeon assigned to Eye, Ear, Nose and Throat.*
WILLIAM H. FISHER, M.D., *Surgical Intern.*
FOREST C. MEADE, M.D., *Surgical Intern.*
★SAMUEL T. R. REVELL, JR., B.S., M.D., *Resident Physician.*
LESLIE HARRELL. PIERCE, B.S., M.D., *Assistant Resident Physician.*
ALVIN S. HARTZ, A.B., M.D., *Assistant Resident Physician.*
ROBERT LINN, M.D., *Resident Obstetrician.*
★WILLIAM S. MILLER, A.B., M.D., *Assistant Resident Obstetrician.*
RICHARD L. GOYNE, B.S., M.D., *Assistant Resident Obstetrician.*
MARTIN CLYMAN, B.S., M.D., *Assistant Resident Obstetrician.*
JOHN T. COLE, M.D., *Obstetrical Intern.*
WILLIAM K. DIEHL, B.S., M.D., *Resident Gynecologist.*
ROLAND E. BIEREN, M.D., *Assistant Resident Gynecologist*
EDWARD G. JONES, A.B., M.D., *Assistant Resident Gynecologist.*
CHARLES N. DAVIDSON, M.D., *Fellow in Roentgenology.*
★GEORGE W. MCCALL, A.B., M.D., *Resident Roentgenologist.*
JAMES J. MCCORT, A.B., M.D., *Assistant Resident Roentgenologist.*
★EARL S. SCOTT, A.B., M.D., *Resident Pediatrician.*
ARNOLD F. LAVENSTEIN, A.B., M.D., *Assistant Resident Pediatrician.*
EDITH RODLER, M.D., *Assistant Resident Pediatrician.*

SENIOR INTERNS

LESTER H. CAPLAN, A.B., M.D.

★EDWIN O. DAUE, B.S., M.D.

★R. L. GIBBS, JR., A.B., M.D.

WALTER R. GRAHAM, A.B., M.D.

BENJAMIN H. INLOES, JR., M.D.

★JAMES R. KARNS, M.D.

H. PEARCE MACCUBBIN, B.S., M.D.

★ROBERT B. MEARNES, M.D.

C. MARTIN RHODE, A.B., M.D.

ALEXANDER F. THOMPSON, A.B., M.D.

WILFRED H. TOWNSHEND, JR., A.B., M.D.

RICHARD T. WILLIAMS, A.B., M.D.

JUNIOR INTERNS

★JOSHUA W. BAXLEY, III, B.S., M.D.

★JAMES S. HUNTER, JR., M.D.

★NORVAL KEMP, A.B., M.D.

★LORMAN L. LEVINSON, A.B., M.D.

MARGARET V. PALMER, M.A., M.D.

★WALTER J. REVELL, B.S., M.D.

EDWIN L. SEIGMAN, A.B., M.D.

★WEBSTER M. STRAYER, A.B., M.D.

RAYMOND K. THOMPSON, B.S., M.D.

★GEORGE J. ULRICH, A.B., M.D.

★JAMES H. WALKER, A.B., M.D.

THOMAS C. WILDER, M.D.

DENTAL INTERN

★EDWARD P. MCDANIEL, JR., D.D.S.

ANNOUNCEMENT OF
UNIVERSITY HOSPITAL RESIDENT AND INTERN STAFF
EFFECTIVE JULY 1, 1942

ROBERT C. SHEPPARD, Ph.G., M.D., *Resident Surgeon.*HENRY A. BRIELE, M.D., *First Assistant Resident Surgeon.*RAYMOND CUNNINGHAM, A.B., M.D., *Assistant Resident Surgeon.*WILLIAM H. FISHER, M.D., *Assistant Resident Surgeon.*FOREST C. MEADE, M.D., *Assistant Resident Surgeon.*RICHARD T. WILLIAMS, A.B., M.D., *Assistant Resident Surgeon.*WILLIAM H. LEITCH, B.S., M.D., *Assistant Resident Surgeon.*AVERILL STOWELL, M.D., *Assistant Resident Surgeon, Assigned to Neurosurgery.*FREDERICK T. KYPER, M.D., Sc.D., *Resident in Otorhinolaryngology.*LESLIE HARRELL PIERCE, B.S., M.D., *Resident Physician.*WILFRED H. TOWNSHEND, JR., A.B., M.D., *Assistant Resident Physician.*H. PEARCE MACCUBBIN, B.S., M.D., *Assistant Resident Physician.*RICHARD GOYNE, B.S., M.D., *Resident Obstetrician.*JOHN T. COLE, M.D., *Assistant Resident Obstetrician.*SCHUYLER KOHN, B.S., M.D., *Assistant Resident Obstetrician.*GEORGE DAVIS, B.S., M.D., *Assistant Resident Obstetrician.*ROLAND E. BIEREN, M. D., *Resident Gynecologist.*EDWARD G. JONES, A.B., M.D., *Assistant Resident Gynecologist.*BENJAMIN H. INLOES, JR., M.D., *Assistant Resident Gynecologist.*JAMES J. MCCORT, A.B., M.D., *Resident Roentgenologist.*ARNOLD F. LAVENSTEIN, A.B., M.D., *Resident Pediatrician.*WILLIAM E. WEEKS, B.S., M.D., *Assistant Resident Pediatrician.*

SENIOR INTERNS

MARGARET V. PALMER, M.A., M.D.

RAYMOND K. THOMPSON, B.S., M.D.

EDWIN L. SEIGMAN, A.B., M.D.

THOMAS C. WILDER, M.D.

ELIZABETH B. SHERRILL, B.S., M.D.

JUNIOR INTERNS

VAN B. BENNETT, A.B., M.D.

THEODORE KARDASH, B.S., M.D.

JOSEPH G. BIRD, B.S., M.D.

ETTA C. LINK, B.S., M.D.

ROBERT A. BARTHEL, JR., B.S., M.D.

LOUIS O. MANGANIELLO, A.B., M.D.

WILLIAM L. BYERLY, JR., B.S., M.D.

WILLIAM T. RABY, B.S., M.D.

RICHARD A. CAREY, B.S., M.D.

JOHN D. ROSIN, A.B., M.D.

JOHN H. FRANZ, A.B., M.D.

EDGAR R. SHIPLEY, A.B., M.D.

DENTAL INTERN

GLENN STEELE, D.D.S.

UNIVERSITY HOSPITAL DISPENSARY STAFF

EMMA WINSHIP, R.N.

Dispensary Director

DISPENSARY COMMITTEE

JOHN E. LEGGE, *Chairman*EMMA WINSHIP, R.N., *Secretary*

L. H. DOUGLASS

★JOHN E. SAVAGE

J. MASON HUNDLEY, JR.

★GEORGE H. YEAGER

C. LORING JOSLIN

RALPH P. TRUITT

Chief of Medical Clinic..... JOHN E. LEGGE

<i>Assistant Chiefs of Medical Clinic</i>	{	★LEWIS P. GUNDRY
		★IRVING FREEMAN
		KURT LEVY
		†SAMUEL LEGUM

<i>Physicians</i>	{	†HARRY G. JONES
		M. A. FINE
		★†HERBERT GOLDSTONE
		†CHARLES R. GOLDSBOROUGH
		†MEYER W. JACOBSON
		†SAMUEL GERTMAN
		★†M. PAUL BYERLY
		†SAMUEL J. HANKIN
	{	†S. LLOYD JOHNSON
		†ANTHONY F. CAROZZA

Chief of Gastro-Enterology Clinic..... ZACHARIAH MORGAN

<i>Assistant Chiefs of Gastro-Enterology Clinic</i>	{★FRANCIS G. DICKEY Z. V. HOOPER
<i>Assistant Gastro-Enterologists</i>	{ERNEST LEVI M. S. KOPPELMAN SAMUEL MORRISON ALBERT J. SHOCHAT WILLIAM GREENFELD CHARLES V. SEVCIK
<i>Chief of Neurology Clinic</i>	LEON FREEDOM
<i>Assistant Neurologists</i>	{BENJAMIN PUSHKIN BERNHARD BADT ★WILLIAM L. FEARING ★HARRY A. TEITELBAUM
<i>Chief of Psychiatric Clinic</i>	RALPH P. TRUITT
<i>Assistant Psychiatrists</i>	{★H. W. NEWELL ★HARRY GOLDSMITH ALICE J. ROCKWELL ★JOSEPH MARSHALL H. ROBERT BLANK †WILLIAM W. ELGIN SAMUEL BARKOFF HANS LOEWALD SIDNEY BERMAN
<i>Chief of Chest Clinic</i>	E. H. TONOLLA
<i>Assistants, Diseases of the Lungs</i>	{MANUEL LEVIN MEYER W. JACOBSON JOHN CONSTANTINI CARL P. ROETLING ★JOSEPH E. MUSE, JR. †HUGH J. WELCH
<i>Chief of Metabolism Clinic</i>	★LEWIS P. GUNDRY
<i>Assistants in Metabolism Clinic</i>	{★WILLIAM G. HELFRICH WALTER E. KARFGIN ★A. GOLDMAN
<i>Chief of Cardiovascular Clinic</i>	★WILLIAM S. LOVE, JR.
<i>Acting Chief of Cardiovascular Clinic</i>	*C. EDWARD LEACH
<i>Assistant Chiefs of Cardiovascular Clinic</i>	{ROBERT W. GARIS ★ROBERT B. MITCHELL, JR.

	{	SAMUEL J. HANKIN
		ANTHONY F. CAROZZA
		†W. G. HERSPERGER
Assistant Cardiologists.....	†	RICHARD S. OWENS
	*	IRVING FREEMAN
	*	HARRY M. ROBINSON, JR.
	*	EPHRAIM T. LISANSKY
	†	F. FREDERICK RUZICKA
Chief of Allergy Clinic.....		H. M. BUBERT
Assistant Chief of Allergy Clinic.....	*	EDWARD S. KALLINS
	{	*PAUL E. CARLINER
	†	NACHMAN DAVIDSON
		SAMUEL SNYDER
Assistant Allergists.....	†	BENJAMIN S. RICH
		FRANK V. MANIERI
	*	S. EDWIN MULLER
	†	RICHARD N. TILLMAN
Allergy Clinic Technician.....		DOROTHY BROSIUS
Director, Pediatric Clinic.....		C. LORING JOSLIN
Chiefs of Pediatric Clinic.....	{	JOHN H. TRABAND
		CLEWELL HOWELL
	{	*M. PAUL BYERLY
		A. H. FINKELSTEIN
		SAMUEL S. GLICK
		F. STRATTNER OREM
	*	ISRAEL P. MERANSKI
		WILLIAM M. SEABOLD
	*	JEROME FINEMAN
		H. WHITNEY WHEATON
		ALBERT JAFFE
Assistant Pediatricians.....		S. LILIENFELD
	*	LAURISTON L. KEOWN
		ISRAEL ROSEN
		JOSEPH R. MEYEROWITZ
	*	GIBSON J. WELLS
		ROBERT J. GORE
		LOUIS B. BLUM
	*	EARL S. SCOTT
		ARNOLD F. LAVENSTEIN
	†	WILLIAM E. WEEKS
Chief of Surgical Clinic.....	*	GEORGE H. YEAGER

	{ J. FRANK HEWITT THURSTON R. ADAMS LUTHER E. LITTLE ★GEORGE H. BROUILLET W. R. JOHNSON ★SAMUEL E. PROCTOR †C. VERNON WILLIAMSON ‡ALBERT R. WILKERSON ‡ROBERT CHENOWITH †JAMES C. OWINGS †CLARENCE P. SCARBOROUGH †WILLIAM B. SETTLE
<i>Assistant Surgeons</i>	
<i>Chief of Orthopaedic Surgery Clinic</i>	ALLEN FISKE VOSHELL
	{ JOHN V. HOPKINS MOSES GELLMAN ★HENRY F. ULLRICH FRED DUCKWALL
<i>Assistant Orthopaedic Surgeons</i>	
<i>Chief of Genito-Urinary Clinic</i>	W. H. TOULSON
	{ W. A. H. COUNCILL JOHN F. HOGAN L. J. MILLAN ★HARRY S. SHELLEY ★HOWARD B. MAYS
<i>Assistant Genito-Urinary Surgeons</i>	
<i>Chiefs of Roentgenology Clinic</i>	{ HENRY J. WALTON ★WALTER L. KILBY
<i>Assistant Roentgenologists</i>	{ †CHARLES W. DAVIDSON ‡EUGENE L. FLIPPIN
<i>Chief of Dermatology Clinic</i>	HARRY M. ROBINSON, SR.
	{ ROLLIN C. HUDSON ‡HAROLD M. GOODMAN ★HARRY M. ROBINSON, JR. JEANNETTE R. HEGHINIAN ★LESTER N. KOLMAN ★MARK HOLLANDER ★BENJAMIN HIGHSTEIN †SOLOMON TANNENBAUM
<i>Assistant Dermatologists</i>	
<i>Chief of Rhinology and Laryngology Clinic</i>	BENJAMIN S. RICH
	{ JOSEPH NURKIN CLEO D. STILES THOMAS R. O'ROURK M. BAYLUS
<i>Assistant Rhinologists and Laryngologists</i>	
<i>Chief of Proctology Clinic</i>	★MONTE EDWARDS
<i>Assistant Proctologist</i>	JAMES C. OWINGS
<i>Chief of Gynecology Clinic</i>	J. MASON HUNDLEY, JR.

<i>Assistant Chief of Gynecology Clinic</i>	BEVERLEY C. COMPTON
	{ THOMAS S. BOWYER † JOSEPH V. CASTAGNA ★ JOHN C. DUMLER JOHN T. HIBBITTS ★ ERNEST I. CORNBROOKS, Jr. WILLIAM B. SETTLE ★ KENNETH B. BOYD W. ALLEN DECKERT † MARIUS P. JOHNSON ★ EVERETT S. DIGGS CHARLES B. MAREK HELEN I. MAGINNIS † IRVIN P. KLEMKOWSKI † WILLIAM K. DIEHL
<i>Assistant Gynecologists</i>	{ J. MASON HUNDLEY, JR. W. ALLEN DECKERT BEVERLEY C. COMPTON ★ JOHN C. DUMLER † WILLIAM K. DIEHL
<i>Female Cystoscopists</i>	★ BRICE M. DORSEY
<i>Chief of Oral Surgery Clinic</i>	{ HAROLD GOLDSTEIN SAMUEL H. BRYANT
<i>Oral Surgeons</i>	★ JOHN E. SAVAGE
<i>Chief of Obstetrical Clinic</i>	† DUDLEY P. BOWE
<i>Assistant Chief of Obstetrical Clinic</i>	{ MARGARET B. BALLARD MAXWELL L. MAZER ★ JAROSLAV HULLA W. ALLEN DECKERT ★ JOSEPH M. BLUMBERG HUGH B. McNALLY ★ FERD E. KADAN ★ JACOB R. JENSEN J. EDWARD NORRIS ★ J. WARREN ALBRITAIN † D. McCLELLAN DIXON ★† W. KENNETH MANSFIELD, Jr. ★† DANIEL I. DANN † D. FRANK KALTREIDER
<i>Assistant Obstetricians</i>	{ J. MASON HUNDLEY, JR. † THOMAS S. BOWYER BEVERLEY C. COMPTON ★ JOHN C. DUMLER † WILLIAM K. DIEHL
<i>Oncology Clinic, Gynecological Division</i>	

	(GRANT E. WARD E. EUGENE COVINGTON J. DUE MOORES
<i>Oncology Clinic, Surgical Division</i>	‡J. W. NELSON ★MURRAY M. COPELAND ★ARTHUR G. SIWINSKI †WILLIAM K. DIEHL
<i>Chief of Ophthalmology Clinic</i>	H. F. GRAFF
	(★FRANK A. HOLDEN THOMAS R. O'ROURK MILTON C. LANG ‡JOHN G. RUNKLE JEROME SNYDER
<i>Assistant Ophthalmologists</i>	
<i>Directress, Occupational Therapy</i>	MISS NANCY VALLIANT
<i>Directress, Social Service</i>	MISS GRACE PEARSON

UNIVERSITY HOSPITAL DISPENSARY REPORT

October 1, 1940 to September 30, 1941

<i>Departments</i>	<i>New Cases</i>	<i>* Old Cases</i>	<i>Total</i>
Allergy Clinic.....	189	4,991	5,180
Cardiology.....	241	2,134	2,375
Curative Workshop.....	62	1,048	1,110
Cystoscopy.....	127	638	765
Dermatology.....	4,930	15,241	20,171
Diabetic.....	81	1,160	1,241
Gastro-Intestinal.....	284	1,486	1,770
Genito-Urinary.....	627	1,605	2,232
Gynecology.....	1,927	5,860	7,787
Hematology.....	18	115	133
Medicine.....	1,980	4,054	6,034
Neurology.....	280	959	1,239
Nose, Throat and Ear.....	1,366	1,296	2,662
Obstetrics.....	1,917	11,505	13,422
Oncology.....	354	2,431	2,785
Ophthalmology.....	1,538	4,294	5,832
Oral Surgery.....	722	870	1,592
Orthopedics.....	1,631	4,126	5,757
Pediatrics.....	2,458	10,980	13,438
Physiotherapy.....	158	1,844	2,002
Plastic Surgery.....	33	51	84
Proctology.....	225	258	483
Psychiatry.....	109	495	604
Surgery.....	1,927	5,860	7,787
Tuberculosis.....	277	2,291	2,568
Total.....	24,221	87,984	112,205

MERCY HOSPITAL
BOARD OF GOVERNORS
★WALTER D. WISE, *Chairman*

SISTER M. VERONICA
SISTER M. CELESTE
SISTER M. THOMASINA
SISTER M. DE CHANTAL
SISTER M. CEPHAS
SISTER M. JOSEPH

HENRY F. BONGARDT
H. RAYMOND PETERS
★MAURICE C. PINCOFFS
WAITMAN F. ZINN
THOMAS K. GALVIN
EDWARD P. SMITH

MERCY HOSPITAL STAFF

Surgeon-in-Chief.....★WALTER D. WISE

Acting Surgeon-in-Chief.....†ELLIOTT H. HUTCHINS

Surgeons.....
(CHARLES F. BLAKE
F. L. JENNINGS
R. W. LOCHER
THOMAS R. CHAMBERS
ELLIOTT H. HUTCHINS
★D. J. PESSAGNO
WILLIAM F. RIENHOFF
N. CLYDE MARVEL
H. F. BONGARDT

Associate Surgeons.....
(I. O. RIDGELY
J. W. NELSON
HOWARD B. MCELWAIN
★SIMON H. BRAGER
JOHN A. O'CONNOR
THOMAS B. AYCOCK
CHARLES W. MAXSON
★I. RIDGEWAY TRIMBLE
★RICHARD T. SHACKELFORD
RAYMOND F. HELFRICH

Assistant Surgeons.....
(JULIUS GOODMAN
E. EUGENE COVINGTON
★S. DEMARCO, JR.
T. J. TOUHEY
WILLIAM N. MCFAYL, JR.
MEYER H. ZURAVIN
★HOWARD L. ZUPNIK
DANIEL R. ROBINSON
★JOSEPH V. JERARDI
†WM. C. DUNNIGAN

Consulting Ophthalmologist and Otologist.....HARRY FRIEDENWALD

Ophthalmologists and Otologists.....
(H. K. FLECK
J. W. DOWNEY
M. RASKIN

<i>Associate Ophthalmologists and Otologists</i>	{ JOSEPH I. KEMLER F. A. PACIENZA
<i>Assistant Ophthalmologist and Otologist</i>	*JOSEPH V. JEPPI
<i>Consulting Rhinologists and Laryngologists</i>	{ W. RAYMOND MCKENZIE GEORGE W. MITCHELL
<i>Rhinologist and Laryngologist</i>	WAITMAN F. ZINN
<i>Associate Rhinologists and Laryngologists</i>	{ †F. A. PACIENZA F. A. KAYSER BENJAMIN S. RICH *THEODORE A. SCHWARTZ *BIRKHEAD MACGOWAN
<i>Assistant Rhinologist and Laryngologist</i>	*JOSEPH V. JEPPI
<i>Bronchoscopist</i>	WAITMAN F. ZINN
<i>Associate Bronchoscopist</i>	F. A. KAYSER
<i>Assistant Bronchoscopist</i>	*THEODORE A. SCHWARTZ
<i>Proctologist</i>	CHARLES F. BLAKE
<i>Assistant Proctologist</i>	E. EUGENE COVINGTON
<i>Orthopaedic Surgeon</i>	ALBERTUS COTTON
<i>Associate Orthopaedic Surgeon</i>	H. L. ROGERS
<i>Assistant Orthopaedic Surgeons</i>	{ I. H. MASERITZ J. H. GASKEL
<i>Urologist</i>	KENNETH D. LEGGE
<i>Associate Urologists</i>	{ LEON K. FARGO FRANCIS W. GILLIS
<i>Dentist</i>	*J. D. FUSCO
<i>Assistant Dentists</i>	{ J. J. FOLEY *B. WALLACE INMAN
<i>Consulting Physician</i>	*MAURICE C. PINCOFFS
<i>Physician-in-Chief</i>	†H. RAYMOND PETERS
<i>Physicians</i>	{ C. B. GAMBLE HARVEY G. BECK THOMAS P. SPRUNT GEORGE MCLEAN J. SHELDON EASTLAND *LOUIS A. M. KRAUSE
<i>Associate Physicians</i>	{ HUBERT C. KNAPP BARTUS T. BAGGOTT THOMAS C. WOLFF WETHERBEE FORT JOHN E. LEGGE T. NELSON CAREY *SOL SMITH
<i>Assistant Physicians</i>	{ S. A. TUMMINELLO J. HOWARD BURNS EARL L. CHAMBERS K. W. GOLLEY J. M. MILLER †WM. H. GRENZER

<i>Gastro-Enterologist</i>	§JULIUS FRIEDENWALD
<i>Associate Gastro-Enterologists</i>	{ T. FREDERICK LEITZ THEODORE H. MORRISON
<i>Assistant Gastro-Enterologists</i>	{ MAURICE FELDMAN JOSEPH SINDLER
<i>Pediatricians</i>	{ EDGAR B. FRIEDENWALD FREDERICK B. SMITH
<i>Associate Pediatricians</i>	{ ★THOMAS J. COONAN G. BOWERS MANSDORFER
<i>Assistant Pediatricians</i>	{ WILLIAM J. SCHMITZ WILLIAM M. SEABOLD ★JEROME FINEMAN
<i>Neurologist and Psychiatrist</i>	ANDREW C. GILLIS
<i>Associate Neurologists and Psychiatrists</i>	{ ★HARRY GOLDSMITH PHILIP F. LERNER
<i>Obstetricians</i>	{ EDWARD P. SMITH ABRAM S. SAMUELS ERNEST S. EDLOW WILLIAM S. GARDNER THOMAS K. GALVIN JOHN J. ERWIN
<i>Associate Obstetrician</i>	†HAROLD H. BURNS
<i>Assistant Obstetrician</i>	WILLIAM B. SMITH
<i>Consulting Gynecologist</i>	WILLIAM S. GARDNER
<i>Gynecologists</i>	{ ABRAM S. SAMUELS THOMAS K. GALVIN EDWARD P. SMITH GEORGE S. STRAUSS, JR.
<i>Associate Gynecologists</i>	{ J. J. ERWIN ERNEST S. EDLOW ★FRANK K. MORRIS
<i>Assistant Gynecologist</i>	★HARRY L. GRANOFF
<i>Pathologists</i>	{ ★WALTER C. MERKEL HUGH R. SPENCER
<i>Clinical Pathologists</i>	{ H. T. COLLENBERG H. RAYMOND PETERS CHARLES E. BRAMBLE
<i>Technicians</i>	{ ELEANOR BEHR GENEVIEVE TIRRELL WILLA MURPHY JANE HOUSE
<i>Radiographer</i>	ALBERTUS COTTON
<i>Associate Radiographer</i>	HARRY L. ROGERS
<i>Assistant Radiographer</i>	★A. D. YOUNG
<i>Technicians</i>	{ SISTER M. KEVIN CHARLOTTE CLOPTER

ANNUAL HOSPITAL APPOINTMENTS

The following annual appointments are made from among the graduates of the school to the Mercy Hospital:

Five Residents in Surgery	Resident in Rhinology
Two Residents in Medicine	Two Residents in Gynecology
Ten Interns on Rotating Service	

MERCY HOSPITAL RESIDENT AND INTERN STAFF JULY 1, 1941 TO JUNE 30, 1942

RESIDENT STAFF

★JOHN F. SCHAEFER, B.S., M.D., *Resident Surgeon*.
HOWARD F. KINNAMON, JR., M.D., *Associate Resident Surgeon*.
F. FORD LOKER, B.S., M.D., *Assistant Resident Surgeon*.
★GEORGE B. BARNES, M.D., *Assistant Resident Surgeon*.
★MELVIN F. POLEK, B.S., M.D., *Assistant Resident Surgeon*.
JOHN L. GILLESPIE, B.S., M.D., *Special Assistant Surgical Resident*.
WILLIAM H. KAMMER, JR., A.B., M.D., *Resident Physician*.
DONALD J. ROOP, A.B., M.D., *Assistant Resident Physician*.
★RAYMOND V. ROBINSON, M.D., *Assistant Resident Physician*.
WILLIAM E. WEEKS, B.S., M.D., *Assistant Resident Physician*.
★WILLIAM A. DODD, B.S., M.D., *Resident Gynecologist*.
HARRY McBRINE BECK, A.B., M.D., *Resident Obstetrician*.
PAUL H. CORRELL, A.B., M.D., *Assistant Resident in Gynecology and Obstetrics*.
WILLIAM C. DUFFY, A.B., M.D., *Assistant Resident in Gynecology and Obstetrics*.
★WILLIAM C. LIVINGOOD, B.S., M.D., *Resident Otolaryngologist*.

INTERNS

★CHARLES P. BARNETT, A.B., M.D.	ROBERT B. SASSCER, A.B., M.D.
★MICHAEL L. DEVINCENTIS, B.S., M.D.	HENRY D. SEVERN, M.D.
★EDWARD L. FREY, JR., A.B., M.D.	JOSEPH C. SHEEHAN, B.S., M.D.
THOMAS A. HEDRICK, M.D.	TRACY N. SPENCER, JR., A.B., M.D.
WILLIAM C. LOWE, B.S., M.D.	JOHN S. STEVENS, A.B., M.D.

ANNOUNCEMENT OF MERCY HOSPITAL RESIDENT AND INTERN STAFF

EFFECTIVE JULY 1, 1942

RESIDENT STAFF

HOWARD F. KINNAMON, JR., M.D., *Resident Surgeon*.
F. FORD LOKER, B.S., M.D., *Associate Resident Surgeon*.
JOHN L. GILLESPIE, B.S., M.D., *First Assistant Resident Surgeon*.
★MICHAEL L. DEVINCENTIS, B.S., M.D., *Assistant Resident Surgeon*.
★TRACY N. SPENCER, JR., A.B., M.D., *Assistant Resident Surgeon*.

THEODORE JOSEPH GRAZIANO, A.B., M.D., *Assistant Resident Surgeon.*

DONALD J. ROOP, A.B., M.D., *Resident Physician.*

WILLIAM C. LOWE, B.S., M.D., *Assistant Resident Physician.*

★EDWARD L. FREY, JR., A.B., M.D., *Assistant Resident Physician.*

THOMAS A. HEDRICK, M.D., *Assistant Resident Physician.*

HARRY MCBRINE BECK, A. B., M.D., *Resident Gynecologist.*

WILLIAM C. DUFFY, A.B., M.D., *Resident Obstetrician.*

JOSEPH C. SHEEHAN, B.S., M.D., *Assistant Resident in Gynecology and Obstetrics.*

ROBERT B. SASSCER, A.B., M.D., *Assistant Resident in Gynecology and Obstetrics.*

CLAUDE RICHMOND DAVISSON, A.B., B.S., M.D., *Resident Otolaryngologist.*

INTERNS

WILLIAM ALSTROM AHROON, A.B., M.D.

HARRY FRANKLIN COFFMAN, A.B., M.D.

MATTHEW MORDICA COX, M.D.

THOMAS EUGENE DAVIES, M.D.

JOHN RUSSELL DAVIS, JR., A.B., M.D.

ROBERT ALLAN KIEFER, A.B., M.D.

JOHN CARLTON OSBORNE, B.S., M.D.

PATRICK CAREY PHELAN, A.B., M.D.

EDWARD PEYTON RITCHINGS, A.B., M.D.

JAMES GEORGE STEGMAIER, B.S., M.D.

MERCY HOSPITAL DISPENSARY STAFF

Supervisor of Surgical Clinic..... RAYMOND F. HELFRICH

Assistant Supervisor of Surgical Clinic..... †HAROLD H. BURNS

I. O. RIDGELY

H. F. BONGARDT

J. W. NELSON

★I. RIDGEWAY TRIMBLE

★SIMON H. BRAGER

★S. DEMARCO, JR.

E. EUGENE COVINGTON

Assistant Surgeons..... ★RICHARD T. SHACKELFORD

MEYER H. ZURAVIN

★HOWARD L. ZUPNIK

DANIEL R. ROBINSON

★JOSEPH V. JERARDI

★RAYMOND J. LIPIN

★WILLIAM M. GARLICK

Supervisor of Genito-Urinary Clinic..... KENNETH D. LEGGE

Assistant Genito-Urinary Surgeons..... { L. K. FARGO
FRANCIS W. GILLIS

ALBERTUS COTTON

HARRY L. ROGERS

Orthopaedic Surgeons..... { I. H. MASERITZ
JASON H. GASKEL

†H. RAYMOND PETERS

★MAURICE C. PINCOFFS

Supervisors of Medical Clinic..... { †EARL L. CHAMBERS

SOL SMITH

Chiefs of Medical Clinic..... { †WILLIAM H. GRENZER

<i>Assistant Physicians</i>	{ ★MILTON STEIN THOMAS G. ABBOTT LOUIS F. KLIMES ★IRVING FREEMAN †NATHANIEL M. BECK
<i>Chief of Cardiovascular Clinic</i>	THOMAS C. WOLFF
<i>Assistant Cardiologist</i>	HARRY ASHMAN
<i>Chief of Metabolism Clinic</i>	J. SHELDON EASTLAND
<i>Assistant</i>	LOUIS F. KLIMES
<i>Supervisor of Gastro-Enterology Clinic</i>	§JULIUS FRIEDENWALD
<i>Gastro-Enterologists</i>	{ MAURICE FELDMAN †NATHANIEL BECK
<i>Chief of Pediatric Clinic</i>	EDGAR FRIEDENWALD
<i>Pediatricians</i>	{ G. BOWERS MANSDORFER ★JEROME FINEMAN GEORGE BAYLEY
<i>Supervisor of Neurological and Psychiatric Clinic</i>	ANDREW C. GILLIS
<i>Neurologists and Psychiatrists</i>	{ ★HARRY GOLDSMITH PHILIP F. LERNER JOHN W. MACHEN GEORGE C. MEDAIREY
<i>Supervisor of Dermatology Clinic</i>	FRANCIS A. ELLIS
<i>Dermatologist</i>	WILLIAM D. WOLFE
<i>Oncologist</i>	JAMES W. NELSON
<i>Chief of Gynecology Clinic</i>	ABRAM S. SAMUELS
<i>Assistant Chief of Gynecology Clinic</i>	THOMAS K. GALVIN
<i>Gynecologists</i>	{ EDWARD P. SMITH ERNEST S. EDLOW ★H. L. GRANOFF JOHN J. ERWIN ★FRANK K. MORRIS GEORGE A. STRAUSS, JR.
<i>Chief of Obstetrical Clinic</i>	EDWARD P. SMITH
<i>Obstetricians</i>	{ ★WILLIAM A. DODD HARRY McBRINE BECK
<i>Esophagoscopist</i>	WAITMAN F. ZINN
<i>Rhinologists and Laryngologists</i>	{ WAITMAN F. ZINN BENJAMIN S. RICH ★THEODORE A. SCHWARTZ
<i>Ophthalmologists and Otologists</i>	{ M. RASKIN F. A. PACIENZA ★JOSEPH V. JEPPI †F. EDWIN KNOWLES, JR.

<i>Supervisor of Proctology Clinic</i>	CHARLES F. BLAKE
<i>Proctologists</i>	{ EUGENE E. COVINGTON ★SIMON H. BRAGER
<i>Dentists</i>	{ ★J. D. FUSCO ★B. WALLACE INMAN
<i>Supervisor of Physiotherapy Clinic</i>	LEON HANNAN
<i>Assistant Physiotherapist</i>	ALICE R. HANNAN
<i>Social Worker</i>	MARGARET TRAVERS
<i>Secretaries</i>	{ MARGARET O'NEILL ELEANOR ARNICK

MERCY HOSPITAL DISPENSARY REPORT

Year of 1941

<i>Department</i>	<i>New Cases</i>	<i>Old Cases</i>	<i>Total</i>
Bronchoscopic.....	208	810	1,018
Cardiac.....	23	355	378
Dental.....	79	98	177
Diabetic.....	9	308	317
Eye and Ear.....	214	766	980
Gastro-Intestinal.....	48	367	415
Genito-Urinary.....	148	1,572	1,720
Gynecology.....	241	809	1,050
Medicine.....	510	2,154	2,664
Neurology.....	59	507	566
Nose and Throat.....	415	1,511	1,926
Orthopaedics.....	197	731	928
Pediatrics.....	222	847	1,069
Physiotherapy.....	123	3,132	3,255
Postnatal.....	255	301	556
Prenatal.....	444	2,434	2,878
Rectal.....	44	98	142
Skin.....	187	388	575
Surgery.....	855	3,445	4,300
Surgical Follow-Up.....	126	402	528
Tumor.....	11	14	25
Well Baby Clinic.....	52	43	95
Total.....	4,470	21,092	25,562

THE BALTIMORE CITY HOSPITALS

STAFF, 1942-1943

PARKER J. McMILLIN, *Superintendent*

<i>Consulting Chief Surgeon</i>	ARTHUR M. SHIPLEY, M.D., D.Sc.
<i>Surgeon-in-Chief</i>	THOMAS B. AYCOCK, B.S., M.D.
<i>Physician-in-Chief</i>	★JOHN T. KING, JR., A.B., M.D.
<i>Physician-in-Chief, X-ray</i>	†HOWARD H. ASHBURY

<i>Physician-in-Chief, Tuberculosis Hospital</i>	†LAWRENCE M. SERRA
<i>Physician-in-Chief, Psychopathic Hospital</i>	ESTHER L. RICHARDS, M.D.
<i>Obstetrician-in-Chief</i>	LOUIS H. DOUGLASS, M.D.
<i>Pediatrician-in-Chief</i>	★T. CAMPBELL GOODWIN, A.B., M.D.
<i>Pathologist-in-Chief</i>	FRANK B. KINDELL, A.B., M.D.
<i>Dental Surgeon-in-Chief</i>	LOWELL P. HENNEBERGER, D.D.S.
<i>Assistant Surgeon-in-Chief</i>	OTTO C. BRANTIGAN, M.D.
<i>Visiting Surgeons</i>	{ JAMES C. OWINGS, M.D.
	{ ★HARRY C. HULL, M.D.
	{ SAMUEL McLANAHAN, JR., A.B., M.D.
	{ †THURSTON R. ADAMS
<i>Consultant in Traumatic Surgery</i>	CHARLES A. REIFSCHNEIDER, M.D.
<i>Consultants in General Surgery</i>	{ †F. C. LEE, M.D.
	{ ★I. RIDGEWAY TRIMBLE, M.D.
<i>Consultant in Peripheral Vascular Diseases</i>	★GEORGE H. YEAGER, B.S., M.D.
<i>Consultants in Plastic Surgery</i>	{ EDWARD A. KITLOWSKI, M.D.
	{ EDWARD M. HANRAHAN, JR., M.D.
<i>Assistant Visiting Surgeons</i>	{ LUTHER E. LITTLE, M.D.
	{ †EDGAR J. POTH
	{ †PHILIP B. PRICE
	{ †HARRIS B. SHUMACKER
<i>Assistant Visiting Physician, Tuberculosis</i>	WILLIAM H. GRENZER, M.D.
<i>Assistant Visiting Psychiatrist</i>	THOMAS A. C. RENNIE, M.D.
<i>Visiting Obstetrician</i>	J. MORRIS REESE, M.D.
<i>Assistant Visiting Obstetricians</i>	{ JOHN M. HAWS, B.S., M.D.
	{ MARIUS P. JOHNSON, A.B., M.D.
	{ ★JOHN E. SAVAGE, B.S., M.D.
	{ HUGH B. McNALLY, B.S., M.D.
	{ WILLIAM DORMAN, M.D.
<i>Visiting Pediatricians</i>	{ ★WILLIAM B. STIFLER, M.D.
	{ ★B. MATTHEW DEBUSKEY, M.D.
<i>Assistant Visiting Pediatrician</i>	WILLIAM M. SEABOLD, A.B., M.D.
<i>Visiting Gynecologist</i>	J. MASON HUNDLEY, JR., M.A., M.D.
<i>Assistant Visiting Gynecologists</i>	{ BEVERLEY COMPTON, M.D.
	{ ★JOHN C. DUMLER, B.S., M.D.
	{ JOHN T. HIBBITTS, M.D.
	{ ★ERNEST I. CORNBROOKS, JR., M.D.
	{ †WILLIAM B. SETTLE
<i>Assistant Chief Physician</i>	{ †WILLIAM K. DIEHL
	{ C. HOLMES BOYD, M.D.
<i>Visiting Physicians</i>	{ ★JOHN W. PARSONS, M.D.
	{ ★LOUIS A. M. KRAUSE, M.D.
<i>Visiting Cardiologist</i>	RAYMOND HUSSEY, M.A., M.D.
<i>Visiting Ophthalmologist</i>	FRANK B. WALSH, M.D.
<i>Visiting Orthopaedic Surgeon</i>	ALLEN F. VOSHELL, A.B., M.D.

<i>Assistant Visiting Orthopaedic Surgeon</i>	★HENRY F. ULLRICH, M.D., D.Sc.
<i>Visiting Laryngologists</i>	{THOMAS R. O'ROURK, M.D. ★JOHN BORDLEY, M.D.
<i>Assistant Visiting Laryngologist</i>	†DONALD F. PROCTOR
<i>Visiting Urologist</i>	W. HOUSTON TOULSON, M.Sc., M.D.
<i>Assistant Visiting Urologists</i>	{★HUGH JEWETT, M.D. ★HOWARD B. MAYS, M.D.
<i>Visiting Neurological Surgeon</i>	CHARLES BAGLEY, JR., M.A., M.D.
<i>Assistant Visiting Neurological Surgeon</i>	RICHARD G. COBLENTZ, M.A., M.D.
<i>Visiting Neurologists</i>	{FRANK R. FORD, M.D. O. R. LANGWORTHY, M.D.
<i>Assistant Visiting Neurologists</i>	{★HARRY A. TEITELBAUM, M.D. LUIS ORTEGA, M.D.
<i>Visiting Proctologist</i>	★MONTE EDWARDS, M.D.
<i>Visiting Oncologists</i>	{GRANT E. WARD, A.B., M.D. ★MURRAY M. COPELAND, M.D.
<i>Assistant Visiting Otologist</i>	J. J. BELEMER, M.D.
<i>Visiting Dermatologist</i>	ISAAC R. PELS, M.D.
<i>Visiting Dental Surgeon</i>	H. GLENN WARING, D.D.S.
<i>Assistant Visiting Dental Surgeons</i>	{L. W. BIMESTEFER, D.D.S. JOSEPH B. BERKE, D.D.S. ★B. W. MIKSINSKI, D.D.S.

THE JAMES LAWRENCE KERNAN HOSPITAL AND INDUSTRIAL SCHOOL OF MARYLAND FOR CRIPPLED CHILDREN

STAFF, 1942-1943

<i>Surgeon-in-Chief and Medical Director</i>	ALLEN FISKE VOSHELL, A.B., M.D.
<i>Attending Orthopaedic Surgeon and Roentgenologist</i>	ALBERTUS COTTON, A.M., M.D.
<i>Associate Orthopaedic Surgeons</i>	{MOSES GELLMAN, B.S., M.D. HARRY ROGERS, M.D. WINTHROP M. PHELPS, A.B., M.D.
<i>Plastic Surgeon</i>	EDWARD A. KITLOWSKI, A.B., M.D.
<i>Aurist and Laryngologist</i>	BENJAMIN S. RICH, A.B., M.D.
<i>Dentist</i>	M. E. COBERTH, D.D.S.
<i>Pediatrist</i>	J. EDMUND BRADLEY, B.S., M.D.
<i>Consulting Surgeons</i>	{§J. M. T. FINNEY, A.B., M.D., D.S.M., F.R.C.S. (Eng., Ire.) Hon. ARTHUR M. SHIPLEY, M.D., Sc.D. C. REID EDWARDS, A.B., M.D. THOMAS B. AYCOCK, B.S., M.D.

§ Died, May 30, 1942.

KERNAN HOSPITAL STAFF

<i>Consulting Aurist and Laryngologist</i>	{ FRANKLIN B. ANDERSON, M.D. EDWARD A. LOOPER, M.D., D.Oph.
<i>Consulting Neurological Surgeon</i>	CHARLES BAGLEY, JR., M.A., M.D.
<i>Consulting Plastic Surgeon</i>	JOHN STAIGE DAVIS, B.Sc., M.D.
<i>Consulting Physicians</i>	{ THOMAS R. BROWN, A.B., M.D. LEWELLYS F. BARKER, A.B., M.D.
<i>Consulting Dermatologists</i>	{ HARRY M. ROBINSON, Sr., M.D. LEON GINSBERG, M.D.
<i>Consulting Neurologists</i>	{ IRVING J. SPEAR, M.D. R. V. SELIGER, M.D.
<i>Consulting Pediatricist</i>	BENJAMIN TAPPAN, A.B., M.D.
<i>Consulting Dentist</i>	HARRY B. MCCARTHY, D.D.S.
<i>Consulting Ophthalmologists</i>	{ HARRY FRIEDENWALD, A.B., M.D., D.H.L., D.Sc. WILLIAM TARUN, M.D.
<i>Consulting Pathologist</i>	HUGH R. SPENCER, M.D.
<i>Consulting Roentgenologists</i>	{ HENRY J. WALTON, M.D. †HOWARD E. ASHBURY, A.B., M.D.
<i>Resident Orthopaedic Surgeons</i>	{ R. C. BELL, M.D. †WILLIAM R. W. MOSES
<i>Superintendent</i>	MISS MAUD M. GARDNER, R.N.
<i>Dispensary and Social Service Nurse</i>	MRS. EVELYN BYRD ZATF, R.N.
<i>Physical Therapists and X-ray Technician</i>	{ ★MISS JANE EWING, P.T., Reg. †MISS JANE ANDERSON, R.N. MRS. GEORGIANA WISONG †MRS. PHYLLIS B. FALLS
<i>Occupational Therapist</i>	MISS MURIEL ZIMMERMAN, O.T.
<i>Instructor in Grammar School</i>	MRS. LAURA SIEMON

HISTORY OF THE SCHOOL OF MEDICINE

The present School of Medicine, with the title University of Maryland School of Medicine and College of Physicians and Surgeons, is the result of a consolidation and merger of the University of Maryland School of Medicine with the Baltimore Medical College (1913) and the College of Physicians and Surgeons of Baltimore (1915).

Through the merger with the Baltimore Medical College, an institution of thirty-two years' growth, the facilities of the School of Medicine were enlarged in faculty, equipment and hospital connection.

The College of Physicians and Surgeons was incorporated in 1872, and established on Hanover Street in a building afterward known as the *Maternité*, the first obstetrical hospital in Maryland. In 1878 union was effected with the Washington University School of Medicine, in existence since 1827, and the college was removed to Calvert and Saratoga Streets. Through the consolidation with the College of Physicians and Surgeons, medical control of the teaching beds in the Mercy Hospital was obtained.

The School of Medicine of the University of Maryland is one of the oldest foundations for medical education in America, ranking fifth in point of age among the medical colleges of the United States. It was organized in 1807, and chartered in 1808, under the name of the College of Medicine of Maryland, and its first class was graduated in 1810. In 1812 the College was empowered by the Legislature to annex three other colleges or faculties: Divinity, Law, and Arts and Sciences; and the four colleges thus united were "constituted an University by the name and under the title of the University of Maryland."

The original building of the Medical School at the N. E. corner of Lombard and Greene Streets, was erected in 1812. It is the oldest structure in this country from which the degree of doctor of medicine has been granted annually since its erection. In this building were founded one of the first medical libraries and one of the first medical school libraries in the United States.

At this Medical School dissection was made a compulsory part of the curriculum, and independent chairs for the teaching of gynecology and pediatrics (1867), and of ophthalmology and otology (1873), were installed for the first time in America.

This School of Medicine was one of the first to provide for adequate clinical instruction by the erection of its own hospital in 1823. In this hospital intramural residency for senior students was established for the first time.

BUILDINGS AND FACILITIES

The original medical building at the N. E. corner of Lombard and Greene Streets houses the office of the Dean, the Conference Room of the Faculty, and two lecture halls.

The Administration Building, to the east of the original building, contains the Baltimore offices of the Registrar and the Director of Admissions and two lecture halls.

The laboratory building at 31 South Greene Street is occupied by the departments of Pathology, Bacteriology and Biochemistry.

The Frank C. Bressler Research Laboratory provides the departments of Anatomy, Histology and Embryology, Pharmacology, Physiology and Clinical Pathology with facilities for teaching and research. It also houses the research laboratories of the clinical departments, animal quarters, a laboratory for teaching Operative Surgery, a lecture hall and the Bressler Memorial Room.

This building was erected in 1939-1940 at 29 South Greene Street opposite the University Hospital. It was built with funds left to the School of Medicine by the late Frank C. Bressler, an alumnus, supplemented by a grant from the Federal government. The structure, in the shape of an I, extends east from Greene Street, just north of the original building.

MEDICAL LIBRARY

CARL W. E. HINTZ, A.B., A.M.L.S.	University Librarian
RUTH LEE BRISCOE	Medical Librarian
JULIA E. WILSON, B.S.	Assistant Medical Librarian

The Medical Library of the University of Maryland, founded in 1813 by the purchase of the collection of Dr. John Crawford, now numbers 22,000 volumes and several thousand pamphlets and reprints. Over three hundred of the leading medical journals, both foreign and domestic, are received regularly. The library is housed in Davidge Hall, a comfortable and commodious building in close proximity to classrooms and laboratories, and is open daily for the use of members of the faculty, the student body and the profession generally. Libraries pertaining to particular phases of medicine are maintained by several departments of the medical school.

The library of the Medical and Chirurgical Faculty of Maryland and the Welch Medical Library are open to students of the medical school without charge. Other libraries of Baltimore are the Peabody Library and the Enoch Pratt Free Library.

DISPENSARY BUILDING

The old hospital building has been remodeled and is occupied by the Out-patient Department. Thus the students have been provided with a splendidly appointed group of clinics for their training in out-patient work. All departments of clinical training are represented in this remodeled building and all changes have been predicated on the teaching function for which this department is intended.

The office of the Medical School Physician is located in this building.

The Department of Art also occupies quarters here.

UNIVERSITY HOSPITAL

The University Hospital, which is the property of the University of Maryland, is the oldest institution for the care of the sick in the state of Maryland. It was opened in September 1823, under the name of the Baltimore Infirmary, and at that time consisted of but four wards, one of which was reserved for patients with diseases of the eye.

In 1933-1934 the new University Hospital was erected, and patients were

admitted to this building in November 1934. The new hospital is situated at the southwest corner of Redwood and Greene Streets, and is consequently opposite the medical school buildings. The students, therefore, are in close proximity and little time is lost in passing from the lecture halls and laboratories to the clinical facilities of the new building.

This new building, with its modern planning, makes a particularly attractive teaching hospital and is a very valuable addition to the clinical facilities of the medical school.

The new hospital has a capacity of 435 beds and 50 bassinets devoted to general medicine, surgery, obstetrics, pediatrics, and the various medical and surgical specialties.

The teaching zone extends from the second to the eighth floor and comprises wards for surgery, medicine, obstetrics, pediatrics, and a large clinical lecture hall. There are approximately 270 beds available for teaching.

The space of the whole north wing of the second floor is occupied by the Department of Roentgenology. The east wing houses clinical pathology and special laboratories for clinical microscopy, biochemistry, bacteriology, and an especially well appointed laboratory for students' training. The south wing provides space for electro-cardiographic and basal metabolism departments, with new and very attractive air-conditioned or oxygen therapy cubicles. The west wing contains the Departments of Rhinology and Bronchoscopy, Industrial Surgery, Ophthalmology, and Male and Female Cystoscopy.

The third and fourth floors each provide two medical and two surgical wards. The fifth floor contains two wards for pediatrics, and on the sixth floor there are two wards for obstetrics. Each ward occupies the space of one wing of the hospital.

On the seventh floor is the general operating suite, the delivery suite, and the central supply station. The eighth floor is essentially a students' floor and affords a mezzanine over the operating and delivery suites, and a students' entrance to the clinical lecture hall.

In the basement there is a very well appointed Pathological Department with a large teaching autopsy room and its adjunct service of instruction of students in pathological anatomy.

The hospital receives a large number of accident patients because of its proximity to the largest manufacturing and shipping districts of the city.

The obstetrical service is particularly well arranged and provides accommodation for forty ward patients. This service, combined with an extensive home service, assures the student abundant obstetrical training.

During the year ending December 31, 1941, 1459 cases were delivered in the hospital and 1191 cases in the outdoor department. Students in the graduating class observed at least thirty-five cases, each student being required to deliver at least ten patients in their homes.

The dispensaries associated with the University Hospital and the Mercy Hospital are organized upon a uniform plan in order that the teaching may be the same in each. Each dispensary has the following departments: Medicine, Surgery, Pediatrics, Ophthalmology, Otology, Genito-Urinary, Gynecology, Gastro-

Enterology, Neurology, Orthopaedics, Proctology, Dermatology, Laryngology, Rhinology, Cardiology, Tuberculosis, Psychiatry, Oral Surgery and Oncology.

All students in their junior year work each day during one-third of the year in the Departments of Medicine and Surgery of the dispensaries. In their senior year, all students work one hour each day in the special departments.

MERCY HOSPITAL

The Sisters of Mercy first assumed charge of the Hospital at the corner of Calvert and Saratoga Streets, then owned by the Washington University, in 1874. By the merger of 1878 the Hospital came under the control of the College of Physicians and Surgeons, but the Sisters continued their work of ministering to the patients.

In a very few years it became apparent that the City Hospital, as it was then called, was much too small to accommodate the rapidly growing demands upon it. However, it was not until 1888 that the Sisters of Mercy, with the assistance of the Faculty of the College of Physicians and Surgeons, were able to lay the cornerstone of the present hospital. This building was completed and occupied late in 1889. Since then the growing demands for more space have compelled the erection of additions, until now there are accommodations for 310 patients.

In 1909 the name was changed from The Baltimore City Hospital to Mercy Hospital.

The clinical material in the free wards is under the exclusive control of the Faculty of the University of Maryland School of Medicine and College of Physicians and Surgeons.

THE BALTIMORE CITY HOSPITALS

The clinical facilities of the School of Medicine have been largely increased by the liberal decision of the Department of Public Welfare to allow the use of the wards of these hospitals for medical education. The autopsy material also is available for student instruction.

Members of the junior class make daily visits to these hospitals for clinical instruction in medicine, surgery, and the specialties.

The Baltimore City Hospitals consist of the following separate divisions:

The General Hospital, 400 beds, 60 bassinets.

The Hospital for Chronic Cases, 575 beds.

The Hospital for Tuberculosis, 280 beds.

The Psychopathic Hospital, 85 beds.

Infirmery (Home for Aged) 1053 beds.

THE JAMES LAWRENCE KERNAN HOSPITAL AND INDUSTRIAL SCHOOL OF MARYLAND FOR CRIPPLED CHILDREN

This institution is situated on an estate of 75 acres at Dickeyville. The site is within the northwestern city limits and of easy access to the city proper.

The location is ideal for the treatment of children, in that it affords all the advantages of sunshine and country air.

A hospital unit, complete in every respect, offers all modern facilities for the care of any orthopaedic condition in children.

The hospital is equipped with 100 beds—endowed, and city and state supported.

The Orthopaedic Dispensary at the University Hospital is maintained in closest affiliation and cares for the cases discharged from the Kernan Hospital. The Physical Therapy Department is very well equipped with modern apparatus and trained personnel. Occupational therapy has been fully established and developed under trained technicians.

THE BALTIMORE EYE, EAR, AND THROAT HOSPITAL

This institution was first organized and operated in 1882 as an outgrowth of the Baltimore Eye and Ear Dispensary, which closed on June 14, 1882. The name then given to the new hospital was The Baltimore Eye and Ear Charity Hospital. It was located at the address now known as 625 W. Franklin St. The out-patient department was opened on September 18, 1882 and the hospital proper on November 1 of the same year. In 1898 a new building afforded 24 free beds and 8 private rooms; by 1907 the beds numbered 47; at present there are 60 beds, 29 of which are free. In 1922 the present hospital building at 1214 Eutaw Place was secured and in 1926 the dispensary was opened. In 1928 a clinical laboratory was installed. During 1941 the out-patient visits numbered 24,000.

Through the kindness of the Hospital Board and Staff, our junior students have access to the dispensary which they visit in small groups for instruction in ophthalmology.

REQUIREMENTS FOR ADMISSION

METHOD OF MAKING APPLICATION

Application forms may be filed one calendar year before the next incoming class. These forms may be secured from the Committee on Admissions, School of Medicine, University of Maryland, Baltimore.

APPLICATION FOR ADMISSION TO THE FIRST YEAR

Application for admission is made by filing the required form and by having all pertinent data sent directly to the Committee on Admissions, in accordance with the instructions accompanying the application.

APPLICATION FOR ADMISSION TO ADVANCED STANDING

Students who have attended approved medical schools are eligible to file applications for admission to the second- and third-year classes. These applicants must be prepared to meet the current first-year entrance requirements in addition to presenting acceptable medical school credentials, and a medical school record based on courses which are quantitatively and qualitatively equivalent to similar courses in this school.

Application to advanced standing is made in accordance with the instructions accompanying the application form.

MINIMUM REQUIREMENTS FOR ADMISSION

The minimum requirements for admission to the School of Medicine are:

- (a) Graduation from an approved secondary school, or the equivalent in entrance examinations, and
- (b) Three academic years of acceptable premedical credit earned in an approved college of arts and sciences. The quantity and quality of this preprofessional course of study shall be not less than that required for recommendation by the institution where the premedical courses are being, or have been, studied.

The premedical curriculum shall include basic courses in

English
Biology
Inorganic Chemistry
Organic Chemistry
Physics
French or German

and such elective courses as will complete a balanced three-year schedule of study.

The elective courses should be selected from the following three groups:

<i>Humanities</i>	<i>Natural Sciences</i>	<i>Social Sciences</i>
English (an advanced course in English composition should be taken, if possible)	Comparative Vertebrate Anatomy	Economics
Scientific German or French (A reading knowledge of either language is desirable, although German is preferred)	Embryology	History
Philosophy	Quantitative Analysis	Political Science
	Physical Chemistry	Psychology (a basic course is desirable)
	Mathematics	Sociology, etc.

Careful attention should be given to the selection of elective courses in the natural sciences. Accordingly, it is suggested that the elective list given above be a guide in this connection and that the remainder of the college credits be accumulated from courses designed to promote a broad cultural development. Students should avoid the inclusion of college courses in subjects that occur in the medical curriculum, for example, histology, histological technique, human anatomy, bacteriology, physiology, neurology, physiological chemistry.

It is not intended that these suggestions be interpreted to restrict the education of students who exhibit an aptitude for the natural sciences or to limit the development of students who plan to follow research work in the field of medicine.

In accepting candidates for admission, preference will be given to those applicants who have acceptable scholastic records in secondary school and college, satisfactory scores in the Medical Aptitude Test, favorable letters of recommendation from their premedical committees, or from one instructor in each of the departments of biology, chemistry, and physics, and who in all other respects give every promise of becoming successful students and physicians of high standing.

Those candidates for admission who are accepted will receive certificates of entrance from the Director of Admissions of the University.

COMBINED COURSE IN ARTS AND SCIENCES, AND MEDICINE

A combined seven years' curriculum leading to the degrees of Bachelor of Science and Doctor of Medicine is offered by the University of Maryland. The first three years are taken in residence in the College of Arts and Sciences at College Park, and the last four years in the School of Medicine in Baltimore. (See University catalogue for details of quantitative and qualitative premedical course requirements.)

Upon the successful completion of the first year in the School of Medicine, and upon the recommendation of the Dean, the degree of Bachelor of Science may be conferred by the College of Arts and Sciences at the commencement following the *second year* of residence.

STATE MEDICAL STUDENT QUALIFYING CERTIFICATES

Candidates for admission who live in or expect to practice medicine in Pennsylvania, New Jersey or New York, should apply to their respective state boards of education for medical student qualifying certificates (Pennsylvania and New Jersey) or approval of applications for medical student qualifying certificates (New York).

Those students who are accepted must file satisfactory State certificates in the office of the Committee on Admissions, School of Medicine, before registration. No exceptions will be made to this requirement.

Addresses of the State Certifying Offices

Director of Credentials Section, Pennsylvania Department of Public Instruction, Harrisburg, Pa.

Chief of the Bureau of Credentials, New Jersey Department of Public Instruction, Trenton, N. J.

Supervisor of Qualifying Certificates, The State Education Department, Examinations and Inspections Division, Albany, N. Y.

DEFINITION OF RESIDENCE STATUS OF STUDENTS*

Students who are minors are considered to be resident students if, at the time of their registration, the parents* have been residents of this State for at least one year.

Adult students are considered to be resident students if, at the time of their registration, they have been residents of this State for at least one year, provided such residence has not been acquired while attending any school or college in Maryland.

The status of the residence of a student is determined at the time of this first registration in the university and may not thereafter be changed by him unless, in the case of a minor, his parents* move to and become legal residents of this state by maintaining such residence for at least one full calendar year. However, the right of the student (minor) to change from a non-resident to a resident status must be established by him prior to registration for a semester in any academic year.

* The term "parents" includes persons who, by reason of death or other unusual circumstances, have been legally constituted the guardians of or stand in loco parentis to such minor students.

FEES

Matriculation fee (paid once).....	\$10.00
Tuition fee (each year)—Residents of Maryland.....	450.00
Tuition fee (each year)—Non-Residents.....	600.00
Laboratory fee (each year).....	25.00
Conditioned examination fee (each subject).....	5.00
Student health service fee (each year).....	10.00
Student activities fee (each year).....	5.00
Maintenance and service fee (each year)... Junior Class, \$7.00; others,	5.00
Graduation fee.....	15.00
Transcript fee to graduates. First copy gratis, each copy thereafter..	1.00

RULES FOR PAYMENT OF FEES

No fees are returnable.

The above fees apply to all students who matriculate in the School of Medicine in any class for the sessions beginning June 25, 1942 and April 8, 1943.

Make all checks or money orders payable to the University of Maryland.

When offering checks or money orders in payment of tuition and other fees, students are requested to have them drawn in the exact amount of such fees. Personal checks whose face value is in excess of the fees due will be accepted for collection only.

Acceptance.—Payment of the matriculation fee of \$10.00 and a deposit on tuition of \$50.00 is required of accepted applicants before the expiration date specified in the offer of acceptance. This \$60.00 deposit is not returnable and will be forfeited if the applicant fails to register, or it will be applied to the applicant's first semester's charges on registration.

Registration.—All students, after proper certification, are required to register at the Office of the Registrar. (See calendar in front of this bulletin for dates for the payments of fees, and the note regarding late registration fee.)

One-half of the tuition fee, the laboratory fee, the student health fee, the student activities fee, and the maintenance and service fee are payable on the date specified for registration for the first semester.

The remainder of the tuition fee shall be paid on the date of registration for the second semester. Fourth year students shall pay the graduation fee, in addition, at this registration.

PENALTY FOR NON-PAYMENT OF FEES

If semester fees are not paid in full on the specified registration dates, a penalty of \$5.00 will be added.

If a satisfactory settlement, or an agreement for settlement, is not made with the Dean within ten days after a payment is due, the student automatically is debarred from attendance on classes and will forfeit the other privileges of the School of Medicine.

REEXAMINATION FEE

A student who is eligible to reexaminations must notify the Dean two weeks in advance of his intention to take the examinations. He will pay the comptroller \$5.00 for each subject in which he is to be examined, and he must present the receipt to the faculty member giving the examination before he will be permitted to take the examination.

MAINTENANCE AND SERVICE FEE

This fee pays for the maintenance of loan collections, provides photographs for departmental requests and state board applications, pays room-rent for the third- and fourth-year students when on outside obstetrics, and furnishes student invitations to the Pre-Commencement Exercises.

PERSONAL EXPENSES

The following estimates of personal expenses for the academic year of eight months have been prepared by students, and are based upon actual experience. In addition to these the student must bear in mind the expenditure for a microscope.

	<i>Low</i>	<i>Average</i>	<i>Liberal</i>
Books.....	\$50	\$75	\$100
College incidentals.....	20	20	20
Board, eight months.....	224	288	352
Room rent.....	144	184	216
Clothing and laundry.....	50	80	150
All other expenses.....	25	50	75
Total	<u>\$513</u>	<u>\$697</u>	<u>\$913</u>

STUDENT HEALTH SERVICE

T. NELSON CAREY, M.D..... Director, Student Health Service

The Medical Council has made provision for the systematic care of students in the Medical School, according to the following plan:

1. *Preliminary Examination*—All new students will be examined during the first week of the semester. Notice of the date, time, and place of the examination will be announced to the classes and on the bulletin board. The passing of this physical examination is necessary before final acceptance of any student.

2. *Medical Attention*—Students in need of medical attention will be seen by the school physician, Dr. T. N. Carey, in his office at the medical school, between 4 and 5 P.M., daily, except Saturday and Sunday. In case of necessity, students will be seen at their homes.

3. *Hospitalization*—If it becomes necessary for any student to enter the hospital during the school year, the Medical Council has arranged for the payment of part or all of his hospital expenses, depending on the length of his stay and special expenses incurred. This applies only to students admitted through the school physician's office.

4. *Physical Defects*—Prospective students are advised to have any known physical defects corrected before entering school in order to prevent loss of time which later correction might incur.

5. *Eye Examination*—Each new matriculate is required to undergo an eye examination at the hands of an oculist (Doctor of Medicine) within three months before entering the School of Medicine. In many students long study hours bring out unsuspected eye defects which cause much loss of time and inefficiency in study if not corrected until after school work is under way.

6. *Limitations*—It is not the function of this service to treat chronic conditions contracted by students before admission, nor to extend treatment to acute conditions arising in the period between academic years, unless the school physician recommends this service.

GENERAL RULES

The right is reserved to make changes in the curriculum, the requirements for graduation, the fees and in any of the regulations whenever the university authorities deem it expedient.

ADVANCEMENT AND GRADUATION

1. All students are required to take the spring examinations unless excused by the Dean.

2. No student will be permitted to pass to a higher class with conditions.

3. Should a student be required to repeat any year in the course, he must pay regular fees.

4. A student failing in final examinations for graduation at the end of the fourth year will be required to repeat the entire course of the fourth year and to take examinations in such other branches as may be required, should he again be permitted to enter the school as a candidate for graduation.

5. The general fitness of a candidate for graduation, as well as the results of his examinations, will be taken into consideration by the faculty.

EQUIPMENT

6. At the beginning of the first year, all students must be prepared to purchase microscopes of a satisfactory type equipped with a mechanical stage and a sub-stage lamp. The cost is about \$177.00, when new.

A standard microscope of either Bausch & Lomb, Leitz, Spencer, or Zeiss make, fitted with the following attachments, will fill the requirements:

Oculars: 10 x and 5 x.

Triple nose piece with 16 mm., 4 mm., and 1.9 mm. 125 N.A. oil immersion lens.

Wide aperture stage with quick screw condenser.

All used microscopes are subject to inspection and approval before their use in the laboratory is permitted. The student is cautioned against the purchase of such an instrument before its official approval by the school.

7. Students in the third- and fourth-year classes are required to furnish their own ophthalmoscopes.

8. Third- and fourth-year students are required to provide haemocytometers.

STATE QUALIFYING CERTIFICATES

9. Candidates for admission who live in or expect to practice medicine in Pennsylvania, New Jersey or New York must file State certificates in the office of the Committee on Admissions, School of Medicine, before registration. No exception will be made to this rule.

EYE EXAMINATION BEFORE ADMISSION

(Effective September, 1941)

10. Each new matriculate in each class is required to present to the Committee on Admissions a certificate from an oculist, (a graduate in medicine) that the matriculate's eyes have been examined and are in condition, with or without glasses as the case may be, to endure the strain of close and intensive reading.

It is required that this examination be completed within three months prior to registration and that the certificate be mailed to the Committee on Admissions not later than one month before registration.

AWARDING OF COMBINED DEGREES

11. Students entering the School of Medicine on a three-year requirement basis from colleges which usually grant a degree on the successful completion of the first year of medicine, are restricted by the following rule:

Upon successful completion of the first year in the School of Medicine, and upon recommendation of the Dean of the School of Medicine, the degree of Bachelor of Science may be conferred by a College of Arts and Sciences following the student's *second year* of residence in the School of Medicine.

COST OF TRANSCRIPTS

12. Graduates will receive the first transcript of record without charge. Subsequent copies will cost one dollar each.

PRIZES

THE FACULTY PRIZE

The faculty will award the gold medal and five certificates of honor to those six of the first ten highest ranking candidates for graduation who, during the four academic years, have exhibited outstanding qualifications for the practice of medicine.

THE DR. A. BRADLEY GAITHER MEMORIAL PRIZE

A prize of \$25.00 is given each year by Mrs. A. Bradley Gaither as a memorial to the late Dr. A. Bradley Gaither, to the student in the senior class doing the best work in genito-urinary surgery.

SCHOLARSHIPS

All scholarships are assigned for one academic year, unless specifically reawarded on consideration of an application.

Official application forms are obtainable at the Dean's office, where they should be filed two months before the ensuing academic year.

THE DR. SAMUEL LEON FRANK SCHOLARSHIP

(Value \$100.00)

This scholarship was established by Mrs. Bertha Rayner Frank as a memorial to the late Dr. Samuel Leon Frank, an alumnus of this university.

It is awarded by the Trustees of the Endowment Fund of the University each year upon nomination by the Medical Council "to a medical student of the University of Maryland, who in the judgment of said Council, is of good character and in need of pecuniary assistance to continue his medical course."

This scholarship is awarded to a second, third or fourth year student who has successfully completed one year's work in this school. No student may hold this scholarship for more than two years.

THE CHARLES M. HITCHCOCK SCHOLARSHIPS

(Value \$100.00 each)

Two scholarships were established from a bequest to the School of Medicine by the late Charles M. Hitchcock, M.D., an alumnus of the university.

These scholarships are awarded annually by the Trustees of the Endowment Fund of the University, upon nomination by the Medical Council, to students who have meritoriously completed the work of at least the first year of the course in medicine, and who present to the council satisfactory evidence of a good moral character and of inability to continue the course without pecuniary assistance.

THE RANDOLPH WINSLOW SCHOLARSHIP

(Value \$100.00)

This scholarship was established by the late Randolph Winslow, M.D., LL.D.

It is awarded annually by the Trustees of the Endowment Fund of the University, upon nomination by the Medical Council, to a "needy student of the Senior, Junior, or Sophomore Class of the Medical School."

"He must have maintained an average grade of 85% in all his work up to the time of awarding the scholarship."

"He must be a person of good character and must satisfy the Medical Council that he is worthy of and in need of assistance."

THE DR. LEO KARLINSKY MEMORIAL SCHOLARSHIP

(Value \$125.00)

This scholarship was established by Mrs. Ray Mintz Karlinsky as a memorial to her husband, the late Dr. Leo Karlinsky, an alumnus of the university.

It is awarded annually by the Trustees of the Endowment Fund of the University, upon the nomination of the Medical Council, to "a needy student of the Senior, Junior or Sophomore Class of the Medical School."

He must have maintained in all his work up to the time of awarding the scholarship a satisfactory grade of scholarship.

He must be a person of good character and must satisfy the Medical Council that he is worthy of and in need of assistance.

THE UNIVERSITY SCHOLARSHIP

A scholarship which entitles the holder to exemption from payment of tuition fee for the year, is awarded annually by the Medical Council to a student of the senior class in need of assistance who presents to the Medical Council satisfactory evidence of good character and scholarship.

THE FREDERICA GEHRMANN SCHOLARSHIP

(Value \$200.00)

(Not open to holders of Warfield and Cohen Scholarships)

This scholarship was established by the bequest of the late Mrs. Frederica Gehrmann and is awarded to a third-year student who at the end of the second year has passed the best practical examinations in physiology, pharmacology, pathology, bacteriology, immunology, serology, surgical anatomy and neuro-anatomy.

THE CLARENCE AND GENEVRA WARFIELD SCHOLARSHIPS

(Value \$300.00 each)

There are five scholarships established by the regents from the income of the fund bequeathed by the will of Dr. Clarence Warfield.

Terms and Conditions: These scholarships are available to students of any of the classes of the course in medicine. Preference is given to students from the counties of the state of Maryland which the Medical Council may from time to time determine to be most in need of medical practitioners.

Any student receiving one of these scholarships must agree, after graduation and a year's internship, to undertake the practice of medicine, for a term of two years, in the county to which the student is accredited, or in a county selected by the council. In the event that a student is not able to comply with the condition requiring him to practice in the county to which he is accredited by the council, the money advanced by the regents shall be refunded by the student.

THE ISRAEL AND CECELIA E. COHEN SCHOLARSHIP

(Value \$150.00)

This scholarship was established by the late Eleanor S. Cohen in memory of her parents, Israel and Cecelia E. Cohen. Terms and conditions: This scholarship will be available to students of any one of the classes of the course in medicine; preference is given to students of the counties in the state of Maryland which the Medical Council may from time to time determine to be most in need of medical practitioners. Any student receiving one of these scholarships must, after graduation and a year's internship, agree to undertake the practice of medicine for a term of two years in the county to which the student is accredited, or in a county selected by the council. In the event that a student is not able to comply with the condition requiring him to practice in the county to which he is accredited by the council, the money advanced by the regents shall be refunded.

THE DR. HORACE BRUCE HETRICK SCHOLARSHIP

(Value \$125.00)

This scholarship was established by Dr. Horace Bruce Hetrick as a memorial to his sons, Bruce Hayward Hetrick and Augustus Christian Hetrick. It is to be awarded by the Medical Council to a student of the senior class.

THE MEDICAL ALUMNI ASSOCIATION SCHOLARSHIP

(Value \$300.00)

This scholarship was established by The Medical Alumni Association of the University of Maryland.

It is awarded, on recommendations of the Board of Directors of the Medical Alumni Association and of the Chairman of the Committee on Admissions of the School of Medicine, to a student of the first year who must furnish satisfactory evidence of good character and scholastic accomplishment and of his inability to pursue the medical course without pecuniary support.

THE HENRY ROLANDO SCHOLARSHIP

(Value approximately \$250.00)

The Henry Rolando Scholarship was established by the Board of Regents of the University of Maryland from a bequest to the Board by the late Anne H. Rolando for the use of the Faculty of Physic.

This scholarship will be awarded each academic year on the recommendation of the Medical Council to a "poor and deserving student."

LOAN FUNDS

W. K. KELLOGG FUND

This loan fund was established for the academic year 1942 with money granted by the W. K. Kellogg Foundation. The interest paid on the loans made will be allowed to accumulate for five years. This, together with the principal of the fund, as repaid, will be used to found a rotating loan fund. Loans will be made from this on the basis of need, character and scholastic attainment.

FACULTY OF PHYSIC LOAN FUND

A Faculty of Physic Loan Fund was established with money derived from the bequest of Dr. William R. Sanderson, Class 1882, and the gift of Dr. Albert Stein, Class 1907. Loans will be made from this on the basis of need, character, and scholastic ability.

ORGANIZATION OF THE CURRICULUM

The following curriculum is the result of a thorough revision of teaching in this school in order to meet modern requirements. The multiplication of specialties in medicine and surgery necessitates a very crowded course and the introduction of electives will very soon be depended on to solve some of the difficulties.

The curriculum is organized under twelve departments.

1. Anatomy (including Histology and Embryology).
2. Physiology.
3. Bacteriology and Immunology.
4. Biological Chemistry.
5. Pharmacology and Materia Medica.
6. Pathology.
7. Medicine (including Medical Specialties).
8. Surgery (including Surgical Specialties).
9. Obstetrics.
10. Gynecology.
11. Ophthalmology.
12. Roentgenology.

The instruction is given in four academic years of graded work.

Several courses of study extend through two years or more, but in no case are the students of different years thrown together in the same course of teaching.

The first and second years are devoted largely to the study of the structures and functions of the normal body. Laboratory work occupies most of the student's time during these two years.

Some introductory instruction in medicine and surgery is given in the second year. The third and fourth years are almost entirely clinical.

A special feature of instruction in the school is the attempt to bring together teacher and student in close personal relationship. In many courses of instruction the classes are divided into small groups and a large number of instructors insures attention to the requirements of each student.

In most courses the final examination as the sole test of proficiency has disappeared and the student's final grade is determined largely by partial examinations, recitations and assigned work carried on throughout the course.

DEPARTMENT OF GROSS ANATOMY

EDUARD UHLENHUTH.....	Professor of Anatomy
FRANK H. J. FIGGE.....	Associate Professor of Gross Anatomy
JAMES C. PLAGGE.....	Assistant Professor of Gross Anatomy
OTTO C. BRANTIGAN.....	Associate in Surgery and Gross Anatomy
★HARRY C. HULL.....	Associate in Surgery
THURSTON R. ADAMS.....	Instructor in Surgery
★HARRY A. TEITELBAUM.....	Instructor in Gross Anatomy
★HERBERT E. REIFSCHNEIDER.....	Assistant in Surgery
★GEORGE H. BROUILLET.....	Assistant in Surgery
★HARRY C. BOWIE.....	Assistant in Surgery and Gross Anatomy
VERNON E. KRAHL.....	Assistant in Gross Anatomy
MILTON L. SOLOMON.....	Research Associate in Gross Anatomy

GROSS ANATOMY. *First Year.* Four lectures and conferences and nineteen hours of laboratory (dissection of the human subject) are given each week during the first semester. Drs. Uhlenhuth, Figge, Plagge and Krahl.

Total hours: 350.

TOPOGRAPHIC AND SURGICAL ANATOMY. *Second Year.* The course is designed to bridge the gap between anatomy in the abstract and clinical anatomy as applied to the study and practice of medicine and surgery. Students are required to demonstrate all points, outlines, and regions on the cadaver. Underlying regions are dissected to bring out outlines and relations of structures.

Two lectures and two laboratory periods are given each week during the second semester. Drs. Brantigan, Covington, Adams, Jones and Settle.

Total hours: 96.

ADVANCED ANATOMY (*elective course*). Selected problems in gross anatomy. This course is intended primarily to offer to the sophomore student an opportunity of extending the knowledge secured in the freshman course. Drs. Uhlenhuth, Figge, Plagge and Brantigan.

Total hours: 64.

In addition to the above courses, facilities for special anatomical problems are offered to the more advanced student and physician.

Graduate Courses. Consult the catalogue of the Graduate School for descriptions of the graduate courses offered by members of the staff.

DEPARTMENT OF HISTOLOGY AND EMBRYOLOGY

CARL L. DAVIS.....	Professor of Anatomy
O. G. HARNE.....	Associate Professor of Histology
JOHN F. LUTZ.....	Assistant Professor of Histology
WALTER L. HARD.....	Assistant Professor of Histology

First Year. The course in histology is divided equally between the study of the fundamental tissues and that of organs. Throughout the entire course the embryology of the part being studied precedes the study of the fully developed tissue. Thus embryology becomes a correlated part of the whole subject of microscopic anatomy and not an independent subject.

Each student is furnished a set of histological slides, previously prepared in our own laboratory, thus insuring a uniform and satisfactory quality of material for study and permitting the time of the student to be expended in the study of material rather than in the technic of its preparation. The object of the course is to present the evidence of function as shown by the structure of tissues and organs. Drs. Davis, Lutz, Harne, and Hard.

An optional laboratory course is offered. This supplements the required course giving laboratory experience which can not be incorporated in the former. No added charge is made for the course.

Total hours: 150.

NEURO-ANATOMY

First Year. Neuro-anatomy embraces a study of the fundamental structure of the central nervous system as applied to its function. An abundance of material

permits of individual dissection of the human brain. A series of appropriately stained sections of the human brain stem is furnished each student for the microscopic study of the internal structure of the nervous system. Drs. Davis, Lutz, Harne, and Hard.

Total hours: 100.

Graduate Courses. Consult the catalogue of the Graduate School for descriptions of the graduate courses offered by members of the staff.

DEPARTMENT OF PHYSIOLOGY

WILLIAM R. AMBERSON.....	Professor of Physiology
DIETRICH CONRAD SMITH.....	Associate Professor of Physiology
ROBERT H. OSTER.....	Assistant Professor of Physiology
EDWARD G. BOETTIGER.....	Instructor in Physiology
JAMES E. P. TOMAN.....	Instructor in Physiology
JOYE E. JACOBS.....	Assistant in Physiology
GUY M. EVERETT.....	Weaver Fellow in Physiology

Five lectures, one conference and two laboratory periods a week, September to January inclusive. The fundamental concepts of physiology are presented with special reference to mammalian problems.

Total hours: 224.

Graduate Courses. Consult the catalogue of the Graduate School for descriptions of the graduate courses offered by members of the staff.

DEPARTMENT OF BACTERIOLOGY AND IMMUNOLOGY

FRANK W. HACHTEL.....	Professor of Bacteriology
JAMES G. MCALPINE.....	Associate Professor of Bacteriology
*HENRY F. BUETTNER.....	Instructor in Bacteriology
H. EDMUND LEVIN.....	Instructor in Bacteriology

The principles of general bacteriology are taught by quiz, conference, and lecture.

Instruction in bacteriology is given in the laboratory to students of the second year class during the first semester. This includes the methods of preparation of culture media, the study of pathogenic bacteria, and the bacteriological examination of water and milk. The bacteriological diagnosis of communicable diseases is also included.

The principles of immunology are presented by means of quizzes, conferences and lectures to the second year class in the second semester.

The course includes a consideration of infection and immunity, the nature and action of the various antibodies, complement fixation and flocculation tests, hypersensitiveness, and the preparation of bacterial vaccines.

Experiments are carried out by the class in the laboratory. During the latter half of the semester the class is divided into sections.

Total hours: Bacteriology 120.

Immunology 72.

Graduate Courses. Consult the catalogue of the Graduate School for descriptions of the graduate courses offered by members of the staff.

DEPARTMENT OF BIOLOGICAL CHEMISTRY

H. BOYD WYLIE.....	Professor of Biological Chemistry
EMIL G. SCHMIDT.....	Associate Professor of Biological Chemistry
GLENN S. WEILAND.....	Assistant Professor of Biological Chemistry
FRANK N. OGDEN.....	Associate in Biological Chemistry
ANN VIRGINIA BROWN.....	Instructor in Biological Chemistry

This course is designed to present the principles of biological chemistry and to indicate their applications to the clinical aspects of medicine. The phenomena of living matter and its chief ingredients, secretions and excretions are discussed in lectures and conferences and examined experimentally. Training is given in biochemical methods of investigation. Total hours: 208.

Graduate Courses. Consult the catalogue of the Graduate School for descriptions of the graduate courses offered by members of the staff.

DEPARTMENT OF PHARMACOLOGY

JOHN C. KRANTZ, JR.	Professor of Pharmacology
C. JELLEFF CARR.....	Associate Professor of Pharmacology
WILLIAM ELLSWORTH EVANS, JR.....	Assistant Professor of Pharmacology
RUTH MUSSER.....	Instructor in Pharmacology
MARIUS P. JOHNSON.....	Assistant in Pharmacology
WILLIAM G. HARNE.....	Demonstrator in Pharmacology
FREDERICK K. BELL.....	U. S. Pharmacopoeia Fellow
SYLVAN FORMAN.....	Fellow in Pharmacology
NORMAN PINSCHMIDT.....	Research Assistant in Pharmacology, International Cancer Research Foundation
MARJORIE RUPPERSBERGER.....	Fellow in Pharmacology
RUTH M. BISHOP.....	Fellow in Pharmacology
EDITH J. WIEGAND.....	Fellow in Pharmacology

This course is designed to include those phases of pharmacology necessary for an intelligent use of drugs in the treatment of disease. The didactic instruction includes materia medica, pharmacy, prescription-writing, toxicology, posology, pharmacodynamics, and experimental therapeutics. The laboratory exercises parallel the course of lectures.

In addition, optional conference periods and lectures are available for students desiring further instruction or advice.

Total hours: 192.

Graduate Courses. Consult the catalogue of the Graduate School for descriptions of the graduate courses offered by members of the staff.

DEPARTMENT OF PATHOLOGY

HUGH R. SPENCER.....	Professor of Pathology
ROBERT B. WRIGHT.....	Associate Professor of Pathology
C. GARDNER WARNER.....	Associate Professor of Pathology
*WALTER C. MERKEL.....	Assistant Professor of Pathology
*D. JAMES GREINER.....	Assistant Professor of Pathology
HOWARD J. MALDEIS.....	Associate in Pathology
ALBERT E. GOLDSTEIN.....	Associate in Pathology

FRANK B. KINDELL.....	Associate in Pathology
★WILLIAM S. LOVE, JR.....	Instructor in Pathology
LEON FREEDOM.....	Instructor in Pathology
BENJAMIN ABESHOUSE.....	Instructor in Pathology
MILTON S. SACKS.....	Instructor in Pathology
HENRY L. WOLLENWEBER.....	Instructor in Pathology
★EDWARD F. COTTER.....	Instructor in Pathology
JOHN A. WAGNER.....	Instructor in Pathology
DAVID HOLLANDER.....	Instructor in Pathology
★CONRAD B. ACTON.....	Assistant in Pathology
★HOWARD B. MAYS.....	Assistant in Pathology
★EPHRAIM T. LISANSKY.....	Assistant in Pathology
KARL F. MECH.....	Assistant in Pathology
DEXTER L. REIMANN.....	Weaver Fellow in Pathology
BENEDICT SKITARELIC.....	Assistant in Pathology

Courses of instruction in Pathology are given during the second and third years. The courses are based on the previous study of normal structure and function and aim to outline the history of disease. The relationship between clinical symptoms and anatomical lesions is constantly stressed.

GENERAL PATHOLOGY. *Second Semester, Second Year.* This course includes the study of disturbances of the body fluids; disturbances of structure, nutrition and metabolism of cells; disturbances of fat, carbohydrate and protein metabolism; disturbances of pigment metabolism; inflammation and tumors.

Laboratory instruction is based on the study of prepared slides (loan collection) and corresponding gross material.

APPLIED PATHOLOGY, INCLUDING GROSS MORBID ANATOMY AND MORBID PHYSIOLOGY. *Third Year.* The laboratory instruction in this course is carried out in small teaching museums where prepared specimens and material from autopsies with clinical histories and sections are available for study. For this work the class is divided into small groups. Clinical correlation is stressed.

AUTOPSIES. *Third Year.* Students in small groups attend autopsies at the morgues of the University Hospital and the Baltimore City Hospitals.

CLINICAL-PATHOLOGICAL CONFERENCE. (*Fourth Year.*) These exercises are held in collaboration with the Department of Medicine. Selected cases are discussed and autopsy findings are presented.

Second year.....	184 hours
Third year.....	160 hours
Fourth year.....	30 hours
Total.....	374 hours

DEPARTMENT OF MEDICINE

★MAURICE C. PINCOFFS.....	Professor of Medicine
THOMAS P. SPRUNT.....	Acting Head of the Department of Medicine and Professor of Clinical Medicine
JOS. E. GICHNER.....	Professor of Clinical Medicine and Physical Therapeutics
G. CARROLL LOCKARD.....	Professor of Clinical Medicine
HARVEY G. BECK.....	Professor of Clinical Medicine
H. RAYMOND PETERS.....	Professor of Clinical Medicine

PAUL W. CLOUGH.....	Associate Professor of Medicine
SYDNEY R. MILLER.....	Associate Professor of Medicine
WALTER A. BAETJER.....	Associate Professor of Medicine
★WM. S. LOVE, JR.....	Associate Professor of Medicine
RAYMOND HUSSEY.....	Associate Professor of Medicine
★LOUIS A. M. KRAUSE.....	Associate Professor of Medicine
T. NELSON CAREY.....	Associate Professor of Medicine
WILLIAM H. SMITH.....	Associate Professor of Clinical Medicine
H. J. MALDEIS.....	Associate Professor of Medical Jurisprudence
GEORGE MCLEAN.....	Assistant Professor of Medicine
JOHN E. LEGGE.....	Assistant Professor of Medicine
THOMAS C. WOLFF.....	Assistant Professor of Medicine
H. M. BUBERT.....	Assistant Professor of Medicine
J. S. EASTLAND.....	Assistant Professor of Medicine
MILTON S. SACKS.....	Assistant Professor of Medicine
★LEWIS P. GUNDRY.....	Assistant Professor of Medicine
E. B. FREEMAN.....	Lecturer in Medicine
CHARLES R. GOLDSBOROUGH.....	Lecturer in Medicine
W. N. BISPHAM, Col., M. C., U. S. A. (ret.).....	Lecturer in Medicine
CLARK H. YEAGER.....	Lecturer in Tropical Medicine
WETTERBEE FORT.....	Associate in Medicine
FRANK J. GERAGHTY.....	Associate in Medicine
E. H. TONOLLA.....	Associate in Medicine
★H. VERNON LANGELOTTIG.....	Associate in Medicine
SOL SMITH.....	Associate in Medicine
★SAMUEL T. HELMS.....	Instructor in Medicine
EARL L. CHAMBERS.....	Instructor in Medicine
DAVID TENNER.....	Instructor in Medicine
★R. B. MITCHELL, JR.....	Instructor in Medicine
SAMUEL LEGUM.....	Instructor in Medicine
ROBERT W. GARIS.....	Instructor in Medicine
M. S. SHILING.....	Instructor in Medicine
H. EDMUND LEVIN.....	Instructor in Medicine
ROBERT A. REITER.....	Instructor in Medicine
W. GRAFTON HERSPERGER.....	Instructor in Medicine
MEYER W. JACOBSON.....	Instructor in Medicine
★CONRAD ACTON.....	Instructor in Medicine
★HUGH G. WHITEHEAD.....	Instructor in Medicine
PHILIP D. FLYNN.....	Instructor in Medicine
★EDWARD S. KALLINS.....	Instructor in Medicine
★IRVING FREEMAN.....	Instructor in Medicine
JOHN A. MYERS.....	Instructor in Medicine
KURT LEVY.....	Instructor in Medicine
★WILLIAM G. HELFRICH.....	Instructor in Medicine
★FRANCIS G. DICKEY.....	Instructor in Medicine
C. EDWARD LEACH.....	Instructor in Medicine
LAWRENCE M. SERRA.....	Instructor in Medicine
★W. H. TRIPLETT.....	Assistant in Medicine
MORRIS FINE.....	Assistant in Medicine
WILLIAM H. GRENZER.....	Assistant in Medicine
★GEORGE SILVERTON.....	Assistant in Medicine

★LAWRENCE KATZENSTEIN.....	Assistant in Medicine
LEON ASHMAN	Assistant in Medicine
★HARRY M. ROBINSON, JR.....	Assistant in Medicine
NATHANIEL BECK	Assistant in Medicine
★JOSEPH M. BLUMBERG.....	Assistant in Medicine
PAUL E. CARLINER.....	Assistant in Medicine
SAMUEL SNYDER.....	Assistant in Medicine
★S. EDWIN MULLER.....	Assistant in Medicine
LOUIS J. KROLL.....	Assistant in Medicine
★JOHN L. ATKINS.....	Assistant in Medicine
★WILLIAM K. WALLER.....	Assistant in Medicine
★EPHRAIM T. LISANSKY.....	Assistant in Medicine
NACHMAN DAVIDSON.....	Assistant in Medicine
RICHARD N. TILLMAN.....	Assistant in Medicine
★SAMUEL T. R. REVELL, JR.....	Assistant in Medicine
★FREDERICK J. VOLLMER.....	Hitchcock Fellow in Medicine
★ARTHUR KARFGIN.....	Assistant in Medicine
★JOSEPH E. MUSE, JR.....	Assistant in Medicine
DANIEL WILFSON, JR.....	Assistant in Medicine
JOSEPH B. GROSS.....	Assistant in Medicine
SAMUEL J. HANKIN.....	Assistant in Medicine
ANTHONY F. CAROZZA.....	Assistant in Medicine
★ROBERT C. CRAWFORD.....	Assistant in Medicine
★CHARLES W. KNERLER.....	Assistant in Medicine
★EDWIN O. DAUE, JR.....	Assistant in Medicine
★ROBERT L. GIBBS.....	Assistant in Medicine
★JAMES R. KARNS.....	Assistant in Medicine
★ROBERT B. MEARNS.....	Assistant in Medicine

GENERAL OUTLINE

SECOND YEAR

Introduction to clinical medicine.

- (a) Introductory physical diagnosis. (1 hour a week, first semester; 2 hours a week, second semester.)
- (b) Medical clinics. (1 hour a week, second semester.)

THIRD YEAR

- I. The methods of examination (13 hours a week). (a) History taking. (b) Physical diagnosis. (c) Clinical pathology.

These subjects are taught and practiced in the hospital out-patient department and in the clinical laboratory.

- II. The principles of medicine (200 hours).

- (a) Lectures, clinics and demonstrations in general medicine, neurology, pediatrics, psychiatry and preventive medicine.

- III. The principles of therapeutics (15 hours). Lectures and demonstrations.

FOURTH YEAR

The practice of medicine.

- I. Clinical clerkship on the medical wards. (26 hours a week for ten weeks.)

- (a) Responsibility, under supervision, for the history, physical examination, laboratory examinations and progress notes of assigned cases.

- (b) Ward classes in general medicine, the medical specialties, and therapeutics.

II. Clinics in general medicine and the medical specialties.

(6 hours a week.)

III. Dispensary work in the medical specialties.

IV. Clinical-pathological conferences (1 hour a week).

MEDICAL DISPENSARY WORK

The medical dispensaries of both the Mercy and the University Hospitals are utilized for teaching in the third year. Each student spends two hours daily for ten weeks in dispensary work. The work is done in groups of four to six students under an instructor. Systematic history-taking is especially stressed. Physical findings are demonstrated. The student becomes familiar with the commoner acute and chronic disease processes.

PHYSICAL DIAGNOSIS

Second Year. Didactic lectures and practical demonstrations in topographical anatomy and normal physical signs. Dr. McLean.

Third Year. The class is divided into small groups, and each section receives instruction for two hours daily for ten weeks. This course is given at the Baltimore City Hospitals. The large clinical material there is utilized to give each student the opportunity to familiarize himself with the common types of bodily structure, with the normal variations in physical signs and with the physical signs of the chief pulmonary, circulatory and abdominal diseases. A course of lectures (1 hour a week) on physical diagnosis supplements the practical work in this subject. Drs. Wolff, Reiter, Ashman, Kroll, Legum and Wilfson.

THERAPEUTICS

Third Year. General therapeutics and materia medica are taken up and an effort is made to familiarize the student with the practical treatment of disease. The special therapy of the chief diseases is then reviewed. One hour a week. Dr. Lockard.

Fourth Year. Special consideration is given to the practical application of therapeutic principles in bedside teaching and the chief therapeutic methods are demonstrated.

Students attend therapeutic ward rounds once a week throughout their medical trimester.

TROPICAL MEDICINE

Certain phases of tropical medicine are considered in the course on Clinical Pathology. In addition, Dr. Clark H. Yeager conducts a course of lectures and demonstrations to the entire fourth year class. The course occupies one hour weekly for twenty weeks.

TUBERCULOSIS

During the third year in connection with the instruction in physical diagnosis a practical course is given at the Municipal Tuberculosis Hospital. Stress is laid upon the recognition of the physical signs of the disease, as well as upon its symptomatology and gross pathology.

CARDIOLOGY

In the third year a series of lectures and clinics correlated with pathological studies is given the entire class.

During the fourth year an elective course in cardiology is offered at the Mercy Hospital. The course occupies one and one-half hours weekly. Physical diagnosis, electrocardiography and the therapeutic management of cardiac cases are stressed.

Elective outpatient work is available also to members of the fourth year class in the Cardiac Clinic of the University Hospital.

SYPHILIS

Third Year. During the third year the subject of syphilis is dealt with in the lecture course.

Fourth Year. An elective course in the therapeutic management of syphilis is offered in the dispensary.

CLINICAL PATHOLOGY

MILTON S. SACKS

Assistant Professor of Medicine and Head of Department of Clinical Pathology	
H. RAYMOND PETERS.....	Professor of Clinical Medicine
*SAMUEL T. HELMS.....	Instructor in Medicine
JOHN A. MYERS.....	Instructor in Medicine
*HUGH G. WHITEHEAD.....	Assistant in Medicine
*JOSEPH M. BLUMBERG.....	Assistant in Medicine
*S. EDWIN MULLER.....	Assistant in Medicine
JOHN A. WAGNER.....	Assistant in Medicine
SOL SMITH.....	Assistant in Medicine
DEXTER L. REIMANN.....	Assistant in Medicine

During the third year the student is thoroughly drilled in the technic of the usual clinical laboratory work, so that he is able to perform all routine examinations which may be called for during his fourth year, in connection with the work in the wards and dispensary.

The practical work is supplemented by a series of didactic lectures and demonstrations in which the entire teaching staff of the department takes an active part. The microscopical and chemical study of blood, exudates and transudates, gastric juice, spinal fluid, feces and urine are successively taken up, and special attention directed to the clinical significance of the findings.

Clinical parasitology from the standpoint of the infecting agent and the carrier is given careful consideration.

The entire course is thoroughly practical. Each student provides his own microscope and blood counters and is supplied a haemoglobinometer for his exclusive use. Every two students are equipped with a special laboratory outfit for all routine purposes.

During the fourth year the student applies in the laboratories of the various affiliated hospitals what he has learned during the preceding year. He is also supplied with a laboratory outfit which is sufficiently complete to enable him to work independently of the general equipment. Special instructors are available during certain hours to give necessary assistance and advice.

GASTRO-ENTEROLOGY

THEODORE H. MORRISON.....	Clinical Professor of Gastro-Enterology
MAURICE FELDMAN.....	Assistant Professor of Gastro-Enterology
ZACHARIAH MORGAN.....	Assistant Professor of Gastro-Enterology
SAMUEL MORRISON.....	Assistant Professor of Gastro-Enterology
JOSEPH SINDLER.....	Associate in Gastro-Enterology
Z. VANCE HOOPER.....	Associate in Gastro-Enterology
M. S. KOPPELMAN.....	Instructor in Gastro-Enterology
ERNEST LEVI.....	Instructor in Gastro-Enterology
ALBERT J. SHOCHAT.....	Instructor in Gastro-Enterology
★FRANCIS G. DICKEY.....	Instructor in Medicine
JOHN A. MYERS.....	Assistant in Gastro-Enterology
WILLIAM GREENFELD.....	Assistant in Gastro-Enterology
NATHANIEL M. BECK.....	Assistant in Gastro-Enterology

Third Year. A series of six lectures is given on the diseases of the digestive tract.

Fourth Year. Clinics and demonstrations are given to the class for one hour a week; dispensary instruction to small groups throughout the entire session. Practical instruction is given in the use of modern methods of study of the diseases of the gastro-intestinal tract.

PSYCHIATRY

ROSS McC. CHAPMAN.....	Professor of Psychiatry
RALPH P. TRUITT.....	Associate Professor of Psychiatry
LAWRENCE F. WOOLLEY.....	Associate Professor of Psychiatry
★HARRY GOLDSMITH.....	Assistant Professor of Psychiatry
★H. W. NEWELL.....	Assistant Professor of Psychiatry
HARRY M. MURDOCK.....	Assistant Professor of Psychiatry
LESLIE B. HOHMAN.....	Lecturer in Psychiatry
★A. RUSSELL ANDERSON.....	Instructor in Psychiatry
★PHILIP S. WAGNER.....	Instructor in Psychiatry
CHARLES SCHMIDT.....	Instructor in Psychiatry
SIDNEY BERMAN.....	Fellow in Psychiatry

First Year. The student attends six lectures dealing with the development and function of the normal personality.

Second Year. The student attends fourteen demonstration lectures on psychopathology.

Third Year. Six hours are devoted to the demonstration of clinical psychopathology; six hours are given to clinical presentation of the psychoses; twelve hours are used for clinical lectures with demonstration and discussion of the management of psychiatric problems encountered in the general practice of medicine; thirty hours are given to history-taking and study of patients in the out-patient clinic.

Fourth Year. The neuroses, psychoneuroses and psychoses are dealt with in ten hours of lectures and demonstrations. In this year the class is divided into sections for clinical conferences on selected cases.

PEDIATRICS

C. LORING JOSLIN	Professor of Pediatrics
EDGAR B. FRIEDENWALD	Professor of Clinical Pediatrics
★T. CAMPBELL GOODWIN	Associate Professor of Pediatrics
JOHN H. TRABAND	Assistant Professor of Pediatrics
ALBERT JAFFE	Assistant Professor of Pediatrics
A. H. FINKELSTEIN	Assistant Professor of Pediatrics
FREDERICK B. SMITH	Assistant Professor of Pediatrics
J. EDMUND BRADLEY	Assistant Professor of Pediatrics
CLEWELL HOWELL	Associate in Pediatrics
SAMUEL S. GLICK	Associate in Pediatrics
F. STRATNER OREM	Associate in Pediatrics
WILLIAM M. SEABOLD	Associate in Pediatrics
★THOMAS J. COONAN	Associate in Pediatrics
G. BOWERS MANSDORFER	Associate in Pediatrics
★M. PAUL BYERLY	Instructor in Pediatrics
★JEROME FINEMAN	Instructor in Pediatrics
★B. MATTHEW DEBUSKEY	Instructor in Pediatrics
★GIBSON J. WELLS	Instructor in Pediatrics
WILSON GRUBB	Instructor in Pediatrics
W. J. SCHMITZ	Assistant in Pediatrics
★ISRAEL P. MERANSKI	Assistant in Pediatrics
H. WHITNEY WHEATON	Assistant in Pediatrics
★LAURISTON L. KEOWN	Assistant in Pediatrics
ISRAEL ROSEN	Assistant in Pediatrics
ROBERT J. GORE	Assistant in Pediatrics
★EARLE S. SCOTT	Assistant in Pediatrics
ARNOLD F. LAVENSTEIN	Assistant in Pediatrics
WILLIAM E. WEEKS	Assistant in Pediatrics
DONALD J. ROOP	Assistant in Pediatrics

Third Year. The course is presented as follows:

Lectures on infant feeding and the fundamentals of diseases of infants and children. (15 hours.)

Lectures on contagious diseases in conjunction with the Department of Hygiene and Preventive Medicine. (14 hours.)

A special course in physical diagnosis is given at City Hospitals. (20 hours.)

Clinical conferences demonstrating diseases of the newly-born. (6 hours.)

Fourth Year. An amphitheatre clinic is given at which patients are shown to demonstrate the features of the diseases discussed. (30 hours.)

Conferences and demonstrations are given in problems concerning diagnosis, care, treatment and clinical pathology of the diseases of infants and children. (30 hours.)

Students are assigned subjects for the preparation of theses.

Clinical clerkships are assigned on the pediatric wards, where experience is gained in taking histories, making physical examinations, doing routine laboratory work, and following up the patients' progress. This is under the supervision of the visiting staff. (140 hours.)

Instruction is given in the pediatric clinic of the out-patient department of the University Hospital. This consists of 1½ hours daily for five weeks—30 minutes each day being devoted to a clinical demonstration of some interesting case by a member of the staff; one hour daily to taking histories and making physical examinations under supervision of one of the staff instructors. (45 hours.)

Total hours: 300.

NEUROLOGY

IRVING J. SPEAR.....	Professor of Neurology
ANDREW C. GILLIS.....	Professor of Neurology
G. M. SETTLE.....	Associate Professor of Neurology and Clinical Medicine
LEON FREEDOM.....	Associate Professor of Neurology
BENJAMIN PUSHKIN.....	Assistant Professor of Neurology
PHILIP F. LERNER.....	Instructor in Neurology
BERNHARD BADT.....	Instructor in Neurology
★WILLIAM L. FEARING.....	Instructor in Neurology
★EDWARD F. COTTER.....	Assistant in Neurology
★HARRY B. TEITELBAUM.....	Assistant in Neurology
JOHN W. MACHEN.....	Assistant in Neurology
GEORGE C. MEDIARY.....	Assistant in Neurology

Second Year. Fifteen one-hour lectures are given to correlate the anatomy and physiology of the nervous system with clinical neurology.

Third Year. Twenty hours of instruction are given to the whole class in neuropathology supplemented with pathological demonstrations. Sixteen lecture-demonstrations are given in which the major types of the diseases of the nervous system are discussed. A course is also given at the Baltimore City Hospitals, comprising eight periods of two hours each, in which the students in small groups carry out complete neurological examinations of selected cases which illustrate the chief neurological syndromes.

Fourth Year. A clinical conference one hour each week is given to the whole class at the University and Mercy Hospitals. All patients presented at these clinics are carefully examined. Complete written records are made by the students who demonstrate the patients before the class. The patients are usually assigned one or two weeks before they are presented, and each student in the class must study and present one or more patients during the year.

Ward Class Instruction. Nine hours of instruction are given to each student in small sections at the University and Mercy Hospitals. In these classes the students come in close personal contact with the patients in the wards under the supervision of the instructor.

Dispensary Instruction. Small sections are instructed in the dispensaries of the University and Mercy Hospitals five afternoons each week. In this way students are brought into contact with nervous diseases in their early and late manifestations.

HYGIENE AND PUBLIC HEALTH

HUNTINGTON WILLIAMS.....	Professor of Hygiene and Public Health
WILLIAM H. F. WARTHEN.....	Assistant Professor of Hygiene and Public Health
ROSS DAVIES.....	Assistant Professor of Hygiene and Public Health
MYRON G. TULL.....	Instructor in Hygiene and Public Health

Third Year. A one-hour lecture is given to the whole class each Monday from September to May. Basic instruction is given in the clinical and public health aspects of the communicable diseases. The lectures are under the auspices of the Department of Medicine and are given by staff members of that department, including physicians representing pediatrics and hygiene and public health.

Fourth Year. Two-hour instruction periods are devoted to the whole class, in groups of ten to fifteen students, on six Wednesday afternoons. These sessions enable the students themselves to prepare birth and death certificates, to vaccinate against smallpox and to conduct other practical public health procedures. In addition there are four Wednesday afternoon field inspection trips for each third of the class. These trips, under guidance of full time public health workers, include visits to (1) city water filtration plant, (2) sewage disposal plant, (3) milk pasteurization plant and bakery and (4) industrial plant which has an active program of hygiene. Elective case work is assigned the Western Health District.

The course deals with the fundamentals of public health and supplements the work in the third year. The major emphasis in both years is on the practice of preventive medicine and the relation of prevention to diagnosis and treatment. The whole class, in small groups, receives practical instruction at Sydenham Hospital, the one-hundred bed communicable disease hospital of the Baltimore City Health Department.

MEDICAL JURISPRUDENCE

HOWARD J. MALDEIS Associate Professor of Medical Jurisprudence
Chief Medical Examiner, Maryland

Third Year. This course embraces a summary of some of the following: Proceedings in criminal and civil prosecution, medical evidence and testimony, identity and its general relations, personal identity, rape, criminal abortions, signs of death, wounds in their medico-legal relations, natural and homicidal death, malpractice, insanity, and medico-legal autopsies.

Total hours: 3.

DEPARTMENT OF SURGERY

ARTHUR M. SHIPLEY Professor of Surgery
★WALTER D. WISE Professor of Surgery
PAGE EDMUNDS Professor of Traumatic Surgery
CHARLES BAGLEY, JR. Professor of Neurological Surgery
ELLIOTT H. HUTCHINS Professor of Clinical Surgery
CHARLES REID EDWARDS Professor of Clinical Surgery
F. L. JENNINGS Professor of Clinical Surgery
THOMAS B. AYCOCK Professor of Clinical Surgery
★D. J. PESSAGNO Clinical Professor of Surgery
★MONTE EDWARDS Clinical Professor of Surgery
THOMAS R. CHAMBERS Associate Professor of Surgery
R. W. LOCHER Associate Professor of Clinical Surgery
EDWARD S. JOHNSON Associate Professor of Surgery
CHARLES A. REIFSCHNEIDER Associate Professor of Traumatic Surgery
N. CLYDE MARVEL Associate Professor of Surgery
RICHARD G. COBLENTZ Associate Professor of Neurological Surgery

GRANT E. WARD.....	Associate Professor of Surgery
CYRUS F. HORINE.....	Associate Professor of Surgery
★GEORGE H. YEAGER.....	Assistant Professor of Surgery
H. F. BONGARDT.....	Assistant Professor of Surgery
★HENRY F. ULLRICH.....	Assistant Professor of Surgery
I. O. RIDGLEY.....	Associate in Surgery
C. W. PEAKE.....	Associate in Surgery
EDWARD A. KITLOWSKI.....	Associate in Plastic Surgery
JAMES W. NELSON.....	Associate in Surgery
★I. RIDGEWAY TRIMBLE.....	Associate in Surgery
★RICHARD T. SHACKELFORD.....	Associate in Surgery
★SIMON H. BRAGER.....	Associate in Surgery
RAYMOND F. HELERICH.....	Associate in Surgery
★HARRY C. HULL.....	Associate in Surgery
OTTO C. BRANTIGAN.....	Associate in Surgery
WILLIAM R. JOHNSON.....	Instructor in Surgery
E. M. HANRAHAN.....	Instructor in Surgery
S. DEMARCO.....	Instructor in Surgery
★KARL J. STEINMUELLER.....	Instructor in Surgery
LUTHER E. LITTLE.....	Instructor in Surgery
J. FRANK HEWITT.....	Instructor in Surgery
★MURRAY M. COPELAND.....	Instructor in Surgery
E. EUGENE COVINGTON.....	Instructor in Surgery
J. DUER MOORES.....	Instructor in Surgery
THURSTON R. ADAMS.....	Instructor in Surgery
★ARTHUR G. SIWINSKI.....	Instructor in Surgery
CALVIN B. HYMAN.....	Instructor in Surgery
WILLIAM R. GERAGHTY.....	Assistant in Surgery
HOWARD B. McELWAIN.....	Assistant in Surgery
A. V. BUCHNESS.....	Assistant in Surgery
T. J. TOUHEY.....	Assistant in Surgery
CLYDE F. KARNS.....	Assistant in Surgery
SAMUEL H. CULVER.....	Assistant in Surgery
ALBERT R. WILKERSON.....	Assistant in Surgery
L. T. CHANCE.....	Assistant in Surgery
SAMUEL McLANAHAN, JR.....	Assistant in Surgery
W. ALLEN DECKERT, JR.....	Assistant in Surgery
★SAMUEL E. PROCTOR.....	Assistant in Surgery
GEORGE GOVATOS.....	Assistant in Surgery
DWIGHT CURRIE.....	Assistant in Surgery
ROBERT F. HEALY.....	Assistant in Surgery
HERBERT M. FOSTER.....	Assistant in Surgery
DANIEL R. ROBINSON.....	Assistant in Surgery
ROBERT F. CHENOWITH.....	Assistant in Surgery
★JOSEPH V. JERARDI.....	Assistant in Surgery
ELDRED ROBERTS.....	Assistant in Surgery
★DONALD B. GROVE.....	Assistant in Surgery
★WILLIAM S. CHENEY.....	Assistant in Surgery
★HERBERT E. REIFSCHNEIDER.....	Assistant in Surgery
★GEORGE H. BROUILLET.....	Assistant in Surgery
★HARRY C. BOWIE.....	Assistant in Surgery

★WILLIAM M. GARLICK.....	Assistant in Surgery
★FREDERICK W. WAKNITZ.....	Assistant in Surgery
★STUART G. COUGHLAN.....	Assistant in Surgery
WILLIAM B. SETTLE.....	Assistant in Surgery
CLARENCE P. SCARBOROUGH.....	Assistant in Surgery
HAROLD H. BURNS.....	Assistant in Surgery
★ERNEST W. MACK.....	Assistant in Surgery
★HUGH H. TROUT, JR.....	Assistant in Surgery
★HENRY L. RIGDON.....	Assistant in Surgery
★OLIVER A. JAMES.....	Assistant in Surgery

Instruction is given by means of lectures, laboratory work, recitations, dispensary work, bedside instruction, ward classes, and clinics. The work begins in the second year, and continues throughout the third and fourth years.

The teaching is done in the anatomical laboratory, operative surgery laboratory, the dispensaries, wards, clinical laboratories and operating rooms of the University and Mercy Hospitals, and in the wards and operating rooms of the Baltimore City Hospitals.

SECOND YEAR

TOPOGRAPHIC AND SURGICAL ANATOMY. The course is designed to bridge the gap between anatomy in the abstract and clinical anatomy as applied to the study and practice of medicine and surgery.

The teaching is done in the anatomical laboratory, and students are required to demonstrate all points, outlines, and regions on the cadaver. Underlying regions are dissected to bring out outlines and relations of structures.

Two lectures and two laboratory periods per week during the second semester. Drs. Brantigan, Adams, Covington, Jones and Settle.

Total hours: 96.

PRINCIPLES OF SURGERY. This course includes history-taking, records of physical examinations, and of operations and progress notes; the preparation of surgical dressings, suture materials and solutions. It includes inflammation, infections, ulcers, gangrene, fistulae and sinuses, hemorrhage, shock and tumors. Lectures and conferences, two hours per week for one semester, are given to the whole class. Dr. Aycock.

THIRD YEAR

GENERAL AND REGIONAL SURGERY. Lectures, recitations and clinics on the principles of surgery and general surgery are given three hours a week to the whole class. Dr. C. R. Edwards.

The class is divided into groups and receives instruction in history-taking, gross pathology, and surgical diagnosis—at the bedside and in the dead-house of the Baltimore City Hospitals. Drs. Aycock, C. A. Reifschneider, Toulson, Brantigan and Adams.

OPERATIVE SURGERY. Two courses are given in operative surgery under the supervision of Dr. Peake assisted by Drs. Chenowith, Deckert, Govatos, Healy, Karns, Mech, Robinson, W. R. Johnson, Hyman and Scarborough. The class

is divided into sections and each section is given practical and individual work under the supervision of the instructors.

FRACTURES AND DISLOCATIONS. This course consists of instruction in the various forms of fractures, dislocations and their treatment. There is a regular schedule of didactic lectures, which is supplemented by practical demonstrations in diagnosis and treatment.

SURGICAL DISPENSARY. Under supervision, the student takes the history, makes the physical examinations, attempts the diagnosis, and, as far as possible, carries out the treatment of the ambulatory surgical patients in the University and in the Mercy Hospitals. Mercy Hospital—Dr. Helfrich assisted by the whole dispensary staff. University Hospital—Drs. Hewitt and Little assisted by the whole dispensary staff.

FOURTH YEAR

CLINICS. A weekly clinic is given at the Mercy and at the University Hospitals to one-half the class throughout the year. As far as possible this is a diagnostic clinic. Mercy Hospital—Dr. Wise. University Hospital—Dr. Shipley.

SURGICAL PATHOLOGY A weekly exercise of one hour at Mercy Hospital for one semester at which specimens from the operating room and museum are studied in the gross and microscopically in relation to the case history. Dr. Pessagno.

TRAUMATIC SURGERY. This course deals with operative and post-operative treatment of accident cases, with instructions as to the relationship between the state, the employee, the employer, and the physician's duty to each. One hour a week to sections of the class throughout the year. Dr. Edmunds.

CLINICAL CLERKSHIP. This work includes the personal study of assigned hospital patients, under supervision of the staffs of the University and Mercy Hospitals, history-taking, and physical examination of patients, laboratory examinations, attendance at operations and observation of post-operative treatment.

WARD CLASSES. Ward-class instruction in small groups will consist of ward rounds, surgical diagnosis, treatment and the after-care of operative cases. Mercy Hospital—Drs. Hutchins, Jennings, Bongardt, Nelson and Marvel. University Hospital—Drs. Shipley, Edmunds, C. R. Edwards and Aycock.

ANAESTHESIA

S. GRIFFITH DAVIS.....	Professor of Anaesthesia
E. HOLLISTER DAVIS.....	Assistant in Anaesthesia
MARY J. O'BRIEN.....	Anaesthetist
RUTH ELLIOTT.....	Anaesthetist
ROSE FURLONG.....	Anaesthetist

THIRD YEAR

Lectures are given on the general physiology of anaesthesia, with consideration of special physiology of each anaesthetic agent; methods of induction and administration of anaesthesia; factors influencing the selection of the anaesthetic and types of anaesthetic agents; and the preparation and care of the anaesthetized patient.

The lectures are correlated with practical demonstrations during operative clinics at the City Hospitals.

FOURTH YEAR

During operative clinics in both surgery and gynecology each student will be given practical instruction in the administration of anaesthetics and will be required to record such changes as take place in blood pressure, pulse and respiration.

DERMATOLOGY

HARRY M. ROBINSON, SR.....	Professor of Dermatology
FRANCIS ELLIS.....	Assistant Professor of Dermatology
JOHN R. ABERCROMBIE.....	Associate in Dermatology
★HARRY M. ROBINSON, JR.....	Associate in Dermatology
★LESTER N. KOLMAN.....	Instructor in Dermatology
ROLLIN C. HUDSON.....	Assistant in Dermatology
JEANNETTE R. HEGHINIAN.....	Assistant in Dermatology
★MARK HOLLANDER.....	Assistant in Dermatology
★BENJAMIN HIGHSTEIN.....	Assistant in Dermatology
SOLOMON TANNENBAUM.....	Assistant in Dermatology

A weekly clinic is given at University and Mercy Hospitals throughout the year. This course consists of demonstrations of the common diseases of the skin, and conferences, in addition to a number of lectures on the general principles of dermatology. Drs. Robinson and Ellis.

Dispensary instruction is given in the diagnosis and treatment of skin diseases at the University Hospital by Dr. Robinson and dispensary staff, and at Mercy Hospital by Dr. Ellis and dispensary staff.

Third year.....	15 hours
Fourth Year.....	49 hours
Total.....	64 hours

ORTHOPAEDIC SURGERY

ALLEN FISKE VOSHELL.....	Professor of Orthopaedic Surgery
ALBERTUS COTTON.....	Professor of Orthopaedic Surgery
COMPTON RIELY.....	Clinical Professor of Orthopaedic Surgery
MOSES GELLMAN.....	Associate Professor of Orthopaedic Surgery
HARRY L. ROGERS.....	Associate Professor of Orthopaedic Surgery
★HENRY F. ULLRICH.....	Assistant Professor of Orthopaedic Surgery
I. H. MASERITZ.....	Instructor in Orthopaedic Surgery
JOHN V. HOPKINS.....	Assistant in Orthopaedic Surgery
JASON H. GASKELL.....	Assistant in Orthopaedic Surgery
★WILLIAM B. LONG, JR.....	Assistant in Orthopaedic Surgery

Didactic, clinical, bedside and out-patient instruction is given to the fourth year at the University and Mercy Hospitals and Dispensaries, Kernan Hospital for Crippled Children at Dickeyville and Baltimore City Hospitals. Instruction is also given to the third year in small groups at the Baltimore City Hospitals.

Weekly lectures throughout the year present all phases of orthopaedic surgery except fractures; brief discussions and demonstrations of physical therapy are included.

Fourth year groups are given more intimate instruction biweekly at one of the above institutions; fracture cases are included here.

Third year.....	60 hours
Fourth year.....	90 hours
Total.....	150 hours

DISEASES OF THE NOSE AND THROAT

EDWARD A. LOOPER.....	Professor of Diseases of the Nose and Throat
WAITMAN F. ZINN.....	Clinical Professor of Diseases of the Nose and Throat
FRANKLIN B. ANDERSON.....	Associate Professor of Diseases of the Nose and Throat
W. RAYMOND MCKENZIE.....	Associate in Diseases of the Nose and Throat
THOMAS R. O'ROURK.....	Associate in Diseases of the Nose and Throat
CLEO D. STILES.....	Associate in Diseases of the Nose and Throat
BENJAMIN S. RICH.....	Associate in Diseases of the Nose and Throat
F. A. KAYSER.....	Assistant in Diseases of the Nose and Throat
*THEODORE A. SCHWARTZ.....	Assistant in Diseases of the Nose and Throat
*WILLIAM C. HUMPHRIES.....	Assistant in Diseases of the Nose and Throat

Third Year. Instruction to whole class is given in the common diseases of the nose and throat, attention being especially directed to infections of the accessory sinuses, the importance of focal infections in the etiology of general diseases and modern methods of diagnosis. Lectures illustrated by lantern slides are given one hour weekly for seven weeks by Dr. Looper.

Fourth Year. Dispensary instruction is given for one and one-half hours daily, to small sections at the University and the Mercy Hospitals. The student is afforded an opportunity to study, diagnose and treat patients under supervision. Ward classes and clinical demonstrations are given in periods of one and one-half hours weekly throughout the session in the University and the Mercy Hospitals.

The Looper Clinic for bronchoscopy and esophagoscopy, recently established in the University Hospital, affords unusual opportunities for students to study diseases of the larynx, bronchi and esophagus. The clinic is open to students daily from 2 to 4 P.M., under direction of Dr. Looper.

The Mercy Hospital clinic for bronchoscopy and esophagoscopy is under the direction of Dr. Zinn. In these two clinics the etiology, symptomatology, diagnosis and treatment of foreign bodies in the air and food passages, as well as bronchoscopy, are taught to students, as an aid in the diagnosis and treatment of diseases of the lungs.

Third year.....	9 hours
Fourth year.....	53 hours
Total.....	62 hours

GENITO-URINARY SURGERY

W. H. TOULSON.....	Professor of Genito-Urinary Surgery
KENNETH D. LEGGE.....	Clinical Professor of Genito-Urinary Surgery
AUSTIN H. WOOD.....	Associate in Genito-Urinary Surgery
L. J. MILLAN.....	Associate in Genito-Urinary Surgery

L. K. FARGO.....	Associate in Genito-Urinary Surgery
JOHN F. HOGAN	Associate in Genito-Urinary Surgery
W. A. H. COUNCILL.....	Associate in Genito-Urinary Surgery
★HARRY S. SHELLEY.....	Associate in Genito-Urinary Surgery
FRANCIS W. GILLIS.....	Associate in Genito-Urinary Surgery
★SAMUEL T. HELMS.....	Instructor in Genito-Urinary Surgery
★HOWARD B. MAYS.....	Instructor in Genito-Urinary Surgery
★HUGH JEWETT.....	Assistant in Genito-Urinary Surgery

Third Year. This course is given for seven hours to the whole class. It consists of lectures and demonstrations, including the use of lantern slides and motion pictures. Dr. Toulson.

Fourth Year. The course in this year includes explanations and demonstrations of urethroscopy, cystoscopy, ureteral catheterization, renal function tests, urography, urine cultures and the various laboratory procedures. The teaching consists of clinics and ward rounds to small groups, and attendance by members of the senior class upon the out-patients in the dispensary. The student here is placed much on his own responsibility in arriving at a diagnosis. Members of the staff are in constant attendance for consultations. These dispensary classes are conducted at both the Mercy and University Hospitals where practically every variety of urogenital disease is seen and used for teaching purposes.

Third year.....	8 hours
Fourth year.....	64 hours
Total.....	<u>72 hours</u>

DISEASES OF THE RECTUM AND COLON

CHARLES F. BLAKE.....	Professor of Diseases of Rectum and Colon
J. DAWSON REEDER.....	Professor of Diseases of Rectum and Colon
★MONTE EDWARDS.....	Clinical Professor of Diseases of Rectum and Colon
JAMES C. OWINGS.....	Instructor in Diseases of the Rectum and Colon
THURSTON R. ADAMS.....	Instructor in Diseases of the Rectum and Colon

Third Year. Seven lectures are given to the whole class. This course is for instruction in the diseases of the colon, sigmoid flexure, rectum and anus, and covers the essential features of the anatomy and physiology of the large intestine as well as the various diseases to which it is subject. Dr. Reeder and Dr. Edwards.

Fourth Year. Ward and dispensary instruction is given in the University and Mercy Hospitals, where different phases of the various diseases are taught by direct observation and examination. The use of the proctoscope and sigmoidoscope in the examination of the rectum and sigmoid is made familiar to each student. Mercy Hospital—Dr. Blake. University Hospital—Drs. Reeder and Monte Edwards.

Third year.....	7 hours
Fourth year.....	16 hours
Total.....	<u>23 hours</u>

OTOLOGY

THOMAS R. O'ROURK.....	Clinical Professor of Otology
FRANKLIN B. ANDERSON.....	Associate Professor of Otology
BENJAMIN S. RICH.....	Associate in Otology
★WILLIAM D. PARR.....	Assistant in Otology
CLEO D. STILES.....	Assistant in Otology
RICHARD S. OWENS.....	Assistant in Otology

The course in otology is planned to give a practical knowledge of the anatomy and physiology of the ear, and its proximity and relationship to the brain and other vital structures. The inflammatory diseases, their etiology, diagnosis, treatment and complications are particularly stressed, with emphasis upon their relationship to the diseases of children, head-surgery and neurology.

Third Year. The whole class is given instruction by means of talks, anatomical specimens and lantern slides.

Fourth Year. Small sections of the class receive instruction and make personal examinations of patients under the direction of an instructor. The student is urged to make a routine examination of the ear in his ward work in general medicine and surgery.

Third year.....	12 hours
Fourth year.....	40 hours
Total.....	52 hours

NEUROLOGICAL SURGERY

CHARLES BAGLEY, JR.....	Professor of Neurological Surgery
RICHARD G. COBLENTZ.....	Associate Professor of Neurological Surgery
JAMES G. ARNOLD, JR., M.D.....	Instructor in Neurological Surgery
★WILLIAM W. MCKINNEY.....	Assistant in Neurological Surgery

Third Year. The course covers instruction in diagnosis and treatment of surgical conditions of the brain, spinal cord and the peripheral nerves. Dr. Bagley.

Fourth Year. Weekly ward rounds and conferences are given at the University Hospital. Drs. Bagley and Coblentz.

Third year.....	12 hours
Fourth year.....	30 hours
Total.....	42 hours

ONCOLOGY

J. MASON HUNDLEY, JR.....	Professor of Gynecology
GRANT E. WARD.....	Associate Professor of Surgery
BEVERLEY C. COMPTON.....	Associate in Gynecology
★JOHN C. DUMLER.....	Associate in Gynecology
★MURRAY M. COPELAND.....	Instructor in Surgery
E. EUGENE COVINGTON.....	Instructor in Surgery
J. DUER MOORES.....	Instructor in Surgery

★ERNEST I. CORNBROOKS, JR.....	Instructor in Gynecology
★ARTHUR G. SIWINSKI.....	Instructor in Surgery
★EVERETT S. DIGGS.....	Assistant in Gynecology
WILLIAM K. DIEHL.....	Assistant in Gynecology

Every facility for the diagnosis and treatment of neoplastic diseases is available; this includes electro-surgery, radium therapy and deep X-ray therapy.

An out-patient clinic is held twice weekly which affords an opportunity for instruction to a limited number of students. The gynecological problems are under the supervision of Dr. Hundley, and the general surgical conditions are under the direction of Dr. Ward.

Instruction, other than dispensary teaching, is given to small groups of students, for one hour a week, in the history, physics and practical application of radium. Drs. Ward and Hundley.

Third year.....	8 hours
Fourth year.....	16 hours
Total.....	24 hours

ORAL SURGERY

★BRICE M. DORSEY.....	Professor of Oral Surgery
CHARLES A. REIFSCHNEIDER.....	Associate Professor of Oral Surgery
GRANT E. WARD.....	Associate Professor of Oral Surgery
WILLIAM E. HAHN.....	Associate Professor of Oral Surgery
VERNON D. KAUFMAN.....	Associate Professor of Oral Surgery
J. HERBERT WILKERSON.....	Assistant Professor of Oral Surgery
★HERBERT E. REIFSCHNEIDER.....	Instructor in Oral Surgery
CONRAD L. INMAN.....	Instructor in Oral Surgery
★B. WALLACE INMAN.....	Instructor in Oral Surgery
DORSEY R. TIPTON.....	Instructor in Oral Surgery

This section in the Department of Surgery is established for the teaching of both medical and dental students. A new subdivision in the dispensary has also been established. Beds will be provided in the University Hospital for the care of patients who will be available for the teaching of students from both schools.

Senior year: clinics weekly.

Ward instruction and group teaching are given. This includes diagnosis and treatment of diseases of the face, mouth and jaws.

INDUSTRIAL MEDICINE AND SURGERY

PAGE EDMUNDS.....	Professor of Traumatic Surgery
G. CARROLL LOCKARD.....	Professor of Clinical Medicine
CHARLES A. REIFSCHNEIDER.....	Associate Professor of Traumatic Surgery and Oral Surgery
THURSTON R. ADAMS.....	Instructor in Surgery

This section is under the combined supervision of the medical and surgical departments. It is a cooperative effort by members of the medical school and hospital staff to afford means for clinical and laboratory study of the patient who

has been subjected to traumatic or medical industrial hazard, so that adequate care may be instituted to promote his physical well-being. The facilities of the laboratories of the medical school and hospital are available as required.

Under direction of this department limited undergraduate instruction is given, especially in the methods of examination and of keeping records; and in the general medico-legal principles as they affect the industrial employee, the employer, the general insurers, the physician and the hospital. There is also instruction on methods of making life insurance and other physical examinations, whether for employment or for health purposes. The wards of the University, Mercy and City Hospitals provide for bed-side instruction.

Total hours: 48.

PLASTIC SURGERY

EDWARD A. KITLOWSKI.....Associate in Plastic Surgery

This course is designed to acquaint students with the problems of reconstructive and plastic surgery. A subdivision in the dispensary has been established and beds for patients will be available for instruction in this course at the University and City Hospitals and Kernan's Hospital for Crippled Children.

Third Year. Five lectures are given to the whole class. Dispensary instruction is provided on Tuesdays and Fridays.

Fourth Year. Ward rounds and operative demonstrations are held at the hospitals.

DEPARTMENT OF OBSTETRICS

L. H. DOUGLASS.....Professor of Obstetrics
 J. MCFARLAND BERGLAND.....Associate Professor of Obstetrics
 EML NOVAK.....Associate Professor of Obstetrics
 J. G. M. REESE.....Assistant Professor of Obstetrics
 M. ALEXANDER NOVEY.....Assistant Professor of Obstetrics
 ISADORE A. SIEGEL.....Assistant Professor of Obstetrics
 ★JOHN E. SAVAGE.....Associate in Obstetrics
 MARGARET B. BALLARD.....Associate in Obstetrics
 DUDLEY P. BOWE.....Associate in Obstetrics
 ★FRANK K. MORRIS.....Instructor in Obstetrics
 HUGH B. McNALLY.....Instructor in Obstetrics
 ★KENNETH B. BOYD.....Assistant in Obstetrics
 W. ALLEN DECKERT.....Assistant in Obstetrics
 ★JAROSLAV HULLA.....Assistant in Obstetrics
 MARIUS P. JOHNSON.....Assistant in Obstetrics
 MAXWELL L. MAZER.....Assistant in Obstetrics
 ★JOSEPH M. BLUMBERG.....Assistant in Obstetrics
 ★FERD. E. KADAN.....Assistant in Obstetrics
 J. EDWARD NORRIS.....Assistant in Obstetrics
 ★JACOB R. JENSEN.....Assistant in Obstetrics
 ★J. WARREN ALBRITAIN.....Assistant in Obstetrics
 D. McCLELLAN DIXON.....Assistant in Obstetrics
 ★W. KENNETH MANSFIELD, JR.....Assistant in Obstetrics
 BERNARD W. DONOHUE.....Assistant in Obstetrics
 GEORGE H. DAVIS.....Assistant in Obstetrics
 ★DANIEL I. DANN.....Assistant in Obstetrics

CHARLES H. DOELLER, JR.	Assistant in Obstetrics
D. FRANK KALTREIDER	Assistant in Obstetrics
RICHARD L. GOYNE	Assistant in Obstetrics
L. CALVIN GAREIS	Assistant in Obstetrics
JOHN T. COLE	Assistant in Obstetrics
SCHUYLER KOHN	Assistant in Obstetrics
★J. KING B. E. SEEGAR	Assistant in Obstetrics

Third Year. The lectures and recitations consisting of three hours teaching weekly are designed to cover the anatomy of the female generative tract and the bony pelvis, the physiology and development of the ovum, and the physiology of pregnancy and labor. Following this the pathology of pregnancy, labor and the puerperium are taken up. Drs. Douglass, Novak, Reese, Novey and Siegel.

Each student spends time during his junior year at the Baltimore City Hospitals observing, assisting and finally delivering patients under strict supervision. Each student sees about twenty deliveries there, and does a considerable amount of the routine work.

The junior students are assigned as assistants to the seniors in the home delivery service and accompany them on deliveries.

Each student receives, in small groups, ten hours instruction in palpation of patients and mensuration of the pelvis and demonstrations of the mechanism of labor. Drs. Siegel and McNally.

Fourth Year. At the weekly clinical conference, cases are presented and discussed and the student body is encouraged to offer opinions and to ask questions. There is no didactic teaching done, and an earnest effort is made to keep it, in every sense of the word, a conference. Dr. Douglass.

The ward classes are held three times weekly for five weeks for each group. Various subjects are assigned and discussed, patients and their histories are presented. Drs. Douglass, Reese and Novey.

Manikin instruction is given once a week. Drs. Bowe, Dixon and Doeller.

During the same five-week period, the students are sent into patients' homes to conduct deliveries under supervision of a senior member of the house staff and with the assistance of a graduate nurse. The student is held responsible for the complete conduct of each assigned case.

Each student spends thirty hours in the prenatal clinic, taking histories and examining patients under supervision.

Finally, the students are invited to attend the monthly meetings of The Committee on Maternal Mortality, where all maternal deaths occurring in Baltimore are openly discussed.

Third year	148 hours
Fourth year	102 hours
Total	250 hours

DEPARTMENT OF GYNECOLOGY

J. MASON HUNDLEY, JR.	Professor of Gynecology
ABRAM S. SAMUELS	Clinical Professor of Gynecology
THOMAS K. GALVIN	Assistant Professor of Gynecology
LEO BRADY	Assistant Professor of Gynecology
R. G. WILLSE	Assistant Professor of Gynecology

GEORGE A. STRAUSS, JR.	Assistant Professor of Gynecology
EDWARD P. SMITH	Assistant Professor of Gynecology
JOHN T. HIBBITTS	Associate in Gynecology
★KENNETH B. BOYD	Associate in Gynecology
★JOHN C. DUMLER	Associate in Gynecology
BEVERLEY C. COMPTON	Associate in Gynecology
HOUSTON EVERETT	Associate in Gynecology
THOMAS S. BOWYER	Instructor in Gynecology
ERNEST S. EDLOW	Instructor in Gynecology
W. ALLEN DECKERT	Instructor in Gynecology
★FRANK K. MORRIS	Instructor in Gynecology
★ERNEST I. CORNBROOKS, JR.	Instructor in Gynecology
WILLIAM B. SETTLE	Instructor in Gynecology
★H. L. GRANOFF	Assistant in Gynecology
J. J. ERWIN	Assistant in Gynecology
HELEN I. MAGINNIS	Assistant in Gynecology
★EVERETT S. DIGGS	Assistant in Gynecology
WILLIAM K. DIEHL	Assistant in Gynecology
ROLAND E. BIEREN	Assistant in Gynecology

Third Year. A course of thirty lectures and recitations is given to the whole class. In addition, a short course of lecture-demonstrations is given at the Baltimore City Hospitals, consisting of eight periods of one hour each, in which small groups of students are instructed in the fundamentals of gynecological diagnosis and examination.

Fourth Year. Operative clinics—lectures and demonstrations—are given six hours per week, for five weeks, to sections of the class.

Instruction in female urology is given. A small number of students may attend the cystoscopic dispensary which is held twice weekly.

The course in gynecology also includes instruction in the diagnosis and treatment of cancer of the generative organs. Small groups of students attend the oncological dispensary for additional work.

Third year	38 hours
Fourth year	74 hours
Total	112 hours

DEPARTMENT OF OPHTHALMOLOGY

CLYDE A. CLAPP	Professor of Ophthalmology
M. RANDOLPH KAHN	Clinical Professor of Ophthalmology
H. K. FLECK	Clinical Professor of Ophthalmology
HENRY F. GRAFF	Assistant Professor in Ophthalmology
JONAS FRIEDENWALD	Lecturer in Ophthalmic Pathology
JOSEPH I. KEMLER	Associate in Ophthalmology
F. EDWIN KNOWLES, JR.	Associate in Ophthalmology
★F. A. HOLDEN	Instructor in Ophthalmology
MILTON C. LANG	Instructor in Ophthalmology
A. KREMEN	Instructor in Ophthalmology
THOMAS R. O'ROURK	Assistant in Ophthalmology
JEROME SNYDER	Assistant in Ophthalmology
★MARION H. GILLIS	Assistant in Ophthalmology

Third Year. Second semester. Dr. Kahn reviews the anatomy and physiology of the eye and discusses the methods used in making the various examinations. Errors of refraction and their effect upon the general system are explained. Weekly section work, demonstrating the use of the ophthalmoscope, is carried on during the entire session.

Fourth Year. Clinics and demonstrations are given in diseases of the eye, weekly, for one year. Dr. Clapp.

This course consists of lectures upon the diseases of the eye, with particular reference to their diagnosis and relation to general medicine. Special lectures will be given upon vascular changes in the eye and upon the pathology of the eye. Some operations will be demonstrated by motion pictures.

Weekly ward classes are held at the University, The Baltimore Eye, Ear and Throat and Mercy Hospitals during which the eye grounds in the various medical and surgical conditions are demonstrated. Also daily demonstrations are given in the taking of histories and the diagnosis and treatment of the various conditions as seen in the dispensary. Drs. Fleck, Kemler, Graff and Knowles.

Third year.....	20 hours
Fourth year.....	<u>104 hours</u>
Total.....	124 hours

DEPARTMENT OF ROENTGENOLOGY

HENRY J. WALTON.....	Professor of Roentgenology
★WALTER L. KILBY.....	Acting Professor of Roentgenology
ALBERTUS COTTON.....	Professor of Roentgenology
CHARLES N. DAVIDSON.....	Associate in Roentgenology
★CHARLES W. REAVIS.....	Assistant in Roentgenology

During the academic year small groups of the fourth year class are given weekly instruction in the diagnostic and therapeutic uses of the Roentgen rays. An effort is made to familiarize the student with the indications for and limitations of Roentgen ray examinations. The history, physics and practical application of Roentgen rays are alluded to but not stressed. Conferences are held with the various departments during the school year which are also open to members of the fourth year class.

Total hours: 96.

HISTORY OF MEDICINE

★LOUIS A. M. KRAUSE.....	Associate Professor of Medicine
--------------------------	---------------------------------

Beginning with this session a group of lectures on the history of medicine will be presented on selected phases and trends of the development of medical knowledge and practice. It is planned to avoid duplication of subject matter for at least four years.

These lectures are offered primarily for our students, but a cordial invitation is extended to anyone who may wish to attend.

Announcement of the lectures will be made by mail and on the bulletin board of the School of Medicine.

ART AS APPLIED TO MEDICINE

★CARL DAME CLARKE.....Associate Professor of Art as Applied to Medicine

This department is maintained for the purpose of supplying pictorial and plastic illustrations for visual teaching in the classrooms of the medical school and for publication in scientific periodicals.

Special courses of instruction are given to qualified students.

FIRST YEAR SCHEDULE **FIRST SEMESTER, JUNE 25, 1942 TO NOVEMBER 14, 1942**

Hours	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9.00 to 12.00	Histology and Embryology 11-12 lecture <i>Bressler 2</i>		Gross Anatomy (9-1)	Histology and Embryology 11-12 lecture <i>Bressler 2</i>		Gross Anatomy
12.00 to 1.00	Lunch			Lunch		
1.00 to 5.00	Gross Anatomy Lectures and Laboratories <i>Bressler 1</i>			Gross Anatomy Lectures and Laboratories <i>Bressler 1</i>		

SECOND SEMESTER, NOVEMBER 16, 1942 TO MARCH 20, 1943

Hours	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9.00 to 12.00	Laboratory — Biological Chemistry <i>Sect. A</i>	Laboratory — Biological Chemistry <i>Sect. B</i>	Laboratory — Biological Chemistry <i>Sect. A</i>	Laboratory — Biological Chemistry <i>Sect. B</i>		
12.00 to 12.50	Lunch	Lunch	Lunch	Lunch	Lunch	
12.50 to 1.50	Biological Chemistry <i>Adm. 1</i>	Biological Chemistry <i>Adm. 1</i>	Biological Chemistry <i>Adm. 1</i>	Biological Chemistry <i>Adm. 1</i>	10.30 to 11.30 Psychiatry <i>Adm. 1</i>	
2.00 to 5.00	*Neuro-anatomy <i>Bressler 2</i>	(Lecture, 2-3) Neuro-anatomy <i>Bressler 2</i>	Biological Chemistry Conference <i>Adm. 1</i>	(Lecture, 2-3) Neuro-anatomy <i>Bressler 2</i>	Biological Chemistry Conference <i>Adm. 1</i>	

* Course begins December 14, 1942.

Locations of Lecture Halls and Laboratories:

Adm. 1—First Floor, Administration Building, Lombard and Greene Streets.
 A. H.—Anatomical Hall—Upper Hall, N. E. Cor. Lombard and Greene Streets.
 C. H.—Chemical Hall, Lower Hall, N. E. Cor. Lombard and Greene Streets.
 Biological Chemistry Laboratory—Third Floor, 31 South Greene Street.
 Bressler Research Laboratory—29 S. Greene Street.
 Gross Anatomy—First Floor
 Histology and Embryology—Second Floor.
 Neuro-anatomy—Second Floor.

Mid-Year Examinations—November 9-14, 1942

Final Examinations—March 15-20, 1943

SECOND YEAR SCHEDULE

FIRST SEMESTER, JUNE 25, 1942 TO NOVEMBER 14, 1942

Hours	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8.30 to 9.30	Physiology <i>Bressler 2</i>	Physiology <i>Bressler 2</i>	Medicine <i>Bressler 2</i>	Physiology <i>Bressler 2</i>	Physiology <i>Bressler 2</i>	
9.30 to 10.30	Physiology Conference <i>Bressler 2</i>	Bacteriology <i>Adm. 1</i>	Physiology <i>Bressler 2</i>	Pharmacology <i>Bressler 2</i>	Pharmacology <i>Bressler 2</i>	
10.30 to 12.30	†Bacteriology Laboratory				Psychiatry <i>C. H.</i> Neurological Diagnosis <i>C. H.</i>	
12.30	Lunch					
1.00 to 5.00	Pharm. Lect. (1-2) Pharmacology <i>B</i> Physiology <i>A</i>	Laboratory <i>A</i> Laboratory <i>B</i>	Elective	Pharmacology <i>B</i> Physiology <i>A</i>	Laboratory (1 to 4) <i>A</i> Laboratory <i>B</i>	

† Bacteriology Laboratory—Section work during the last month.

SECOND SEMESTER, NOVEMBER 16, 1942 TO MARCH 20, 1943

Hours	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8.30 to 9.30	Surgery <i>Bressler 2</i>	Surgery <i>Bressler 2</i>	Surgical Anatomy <i>Bressler 2</i>		Physical Diagnosis <i>Bressler 2</i> 4 lectures	
9.30 to 10.30	Pharmacology <i>Bressler 2</i>	Pharmacology <i>Bressler 2</i>	Surgical Anatomy Laboratory	9-10 Medical Clinic <i>Amp.</i>	Pharmacology <i>Bressler 2</i>	
10.30 to 11.30	Pathology <i>C. H.</i>	Pathology <i>C. H.</i>	<i>Bressler 1</i>	Pathology <i>C. H.</i>	Pathology <i>C. H.</i>	
11.30	Lunch					
12.00 to 2.00	Pathology Laboratory	Pathology Laboratory	Immunology	Pathology Laboratory	Pathology Laboratory	
2.00 to 3.00	Surgical Anatomy <i>Bressler 2</i>	|| Immunology	Laboratory	Pharmacology Laboratory <i>Sect. A</i>	Pharmacology Laboratory <i>Sect. B</i>	
3.00 to 5.00	Surgical Anatomy Laboratory <i>Bressler 1</i>	Laboratory	Optional period Pathology Immunology	Physical Diagnosis <i>Sect. B</i> (3.00-5.00) <i>U. H. D.</i>	Physical Diagnosis <i>Sect. A</i> (3.00-5.00) <i>U. H. D.</i>	

|| Immunology Laboratory—Section work during last two months.

Locations of Lecture Halls and Laboratories:

Adm. 1—First floor, Administration Building, Lombard and Greene Streets.

C. H.—Chemical Hall, Lower Hall, Lombard and Greene Streets.

Amp.—Wilson Memorial Amphitheatre, New University Hospital, Greene and Redwood Streets, Eighth Floor.

U. H. D.—University Hospital Dispensary, Old Hospital Building.

Laboratories:

Physiology, Pharmacology, Surgical Anatomy—Bressler Building.

Bacteriology, Immunology, Pathology, Second Floor, 31 S. Greene Street.

Mid-Year Examinations—November 9-14, 1942

Final Examinations—March 15-20, 1943

THIRD YEAR SCHEDULE

JUNE 25, 1942 TO MARCH 20, 1943

SCHEDULE 1

Hours	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8.30 to 9.30	(Whole Class) Obstetrics <i>C. H.</i> †Gynecology Feb. 8 to Mar. 1	(Whole Class) Surgery <i>C. H.</i>	(Whole Class) Obstetrics <i>C. H.</i> †Gynecology Feb. 10 to Mar. 3	(Whole Class) Surgery <i>C. H.</i>	(Whole Class) Pathology <i>C. H.</i>	(Whole Class) Surgery <i>C. H.</i> †Gynecology Nov. 21 to †Jan. 23, inc.
9.30 to 10.00	Transfer to Baltimore City Hospitals					
10.00 to 12.00	Physical Diagnosis, Pathology, Neurology and Pediatrics at B. C. H.					
12.00 to 1.00	Transfer and Lunch	Transfer and Lunch	Lunch	Transfer and Lunch	Lunch	
1.00 to 2.00	(Whole Class) Proctology, Otology, Urology, Nose & Throat, Plastic Surgery <i>C. H.</i>	(Whole Class) *Gynecology †Eye—10 wks. (Nov. 17 to Jan. 26) †Oncology —5 wks. (Feb. 2 to Mar. 2) <i>C. H.</i>	Medical Clinic <i>B. C. H.</i>	(Whole Class) Clinical Pathology <i>Bressler 2</i>	Obstetrical Clinic <i>B. C. H.</i>	
2.00 to 4.00	(Whole Class) Pathology Laboratory <i>31</i>		Surgery (2.00 to 4.00) — Pediatrics (2.00 to 4.30) —	(Whole Class) Clinical Pathology	Surgery (2.00 to 4.00) — Pediatrics (2.00 to 4.30) —	
4.00 to 5.00	(Whole Class) Hygiene and Public Health <i>C. H.</i>	(Whole Class) Physical Diagnosis, Psychiatry, Legal Medicine <i>C. H.</i>	Gynecology Orthopaedics Psychiatry (Subgroups of Surgery Group) (4.00 to 5.00)	— Laboratory <i>Bressler 5</i>	Gynecology Orthopaedics Psychiatry (Subgroups of Surgery Group) (4.00 to 5.00)	

* First Semester.

† Second Semester.

‡ No classes after Jan. 23.

THIRD YEAR SCHEDULE

SCHEDULE 2

Hours	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8.30 to 9.30	Same as Schedule 1					
9.30 to 10.20	Pediatrics <i>C. H.</i>	Medicine <i>C. H.</i>	Medicine <i>C. H.</i>	Therapeutics <i>C. H.</i>	Medicine <i>C. H.</i>	Neurology <i>C. H.</i>
10.30 to 12.30	Operative Surgery— <i>Bressler 6</i> Medical and Surgical Dispensaries—(Univ. and Mercy Sections)					
12.30 to 1.00	Lunch					
1.00 to 2.00	Same as Schedule 1		Medical Clinic <i>Amp.</i>	Same as Schedule 1	Psychiatry (9 weeks) Dermatology (6 weeks) N.B.—The whole section reports to psychiatry for first three weeks, then subdivides.	
2.00 to 4.00			Ophthalmoscopy (5 weeks) <i>B. E. H.</i> — Obstetrics (5 weeks) Univ. Hosp. Disp. — Otology (5 wks.) <i>Bressler 5</i> <i>Conf. Room</i>		<i>C. H.</i> for first 3 wks. U. H. Disp. Last 12 wks.	
4.00 to 5.00					Obstetrics <i>C. H.</i>	

The Junior Class will be divided into two sections—A and B. Each section reports to classes in keeping with the following schedule assignment, in which the letters represent the class sections and the numerals indicate the schedules to be followed for the 15-week periods shown.

Schedule Assignment

Periods	Sections and Schedules
June 25 to November 7	A-1, B-2
November 16 to March 6	B-1, A-2

Locations of Lecture Halls, etc.

A. H.—Anatomical Hall, Upper Hall, N. E. Cor. Lombard and Greene Streets.
Amp.—Wilson Memorial Amphitheatre, New University Hospital, Eighth Floor.
B. C. H.—Baltimore City Hosps., 4940 Eastern Ave.
B. E. H.—Baltimore Eye, Ear and Throat Hospital, 1214 Eutaw Place.
Bressler—Bressler Building, 29 S. Greene Street.
C. H.—Chemical Hall, Lower Hall, N. E. Cor. Lombard and Greene Streets.
Univ. Hosp.—New University Hospital, Greene and Redwood Streets.
U. H. Disp.—Old Hospital Building, S. W. Cor. Lombard and Greene Streets.
31—31 South Greene Street.
Clinical Pathology Laboratory—Fifth Floor, Bressler Building.
Pathology Laboratory—31 South Greene Street, Special Rooms, Basement.

Mid-Year Examinations—November 9-14, 1942

Final Examinations—March 8-20, 1943

FOURTH YEAR SCHEDULE

JUNE 25, 1942 TO MARCH 20, 1943

Hours	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Ward Classes	Ward Classes	Ward Classes	Ward Classes	Ward Classes	Ward Classes
9.00 to 10.00	(a) Medicine (a) Surgery (b) Obstetrics (d) Pediatrics	(a) Medicine (a) Surgery (b) Gynecology (c) Gynecology	(a) Medicine (a) Surgery (b) Obstetrics (d) Pediatrics	(a) Medicine (a) Surgery (b) Gynecology (c) Gynecology	(a) Medicine (a) Surgery (b) Obstetrics (d) Pediatrics	(a) Medicine (a) Surgery (b) Gynecology (d) Pediatrics
10.00 to 11.00	Orthopaedic Surgery <i>Univ. Sec. Amp. P. & S. Sec. 51</i>	Medical Clinic <i>Univ. Sec. Amp. P. & S. Sec. 40</i> Surgical Pathology <i>P. & S. Sec. 40</i>	Clinical Pathological Conference <i>Univ. Sec. Amp. P. & S. Sec. 34</i>	Surgical Clinic <i>Univ. Sec. Amp. P. & S. Sec. 51</i>	Medical Clinic <i>Univ. Sec. Amp. P. & S. Sec. 34</i>	Pediatric Clinic <i>Univ. Sec. Amp. P. & S. Sec. 34</i>
11.00 to 12.00	Dispensary, Clinical Work: Wards and Laboratory					
12.00 to 12.30	Lunch					
12.30 to 2.00	Special Dispensary—see posting in Dispensary					
2.15 to 3.15	Dermatology Clinic 1st time <i>Disp. Amp. then divide</i> <i>Univ. Sec. { Disp. Amp. P. & S. Sec. 34</i>	Neurology Clinic <i>Univ. Sec. Amp. P. & S. Sec. 34</i>	Eye and Ear Clinic (Full Class at Univ. Hosp.) <i>Amp.</i>	Obstetrical Clinic (Full Class at Univ. Hosp.) <i>Amp.</i>	Hygiene and Public Health June 26 to July 31 Gastro-Enter- ology Clinic Sept. 4 (Full Class at Univ. Hosp.) <i>Amp.</i>	
3.30 to 5.00	<i>P. & S. Sect. and Univ. Sect. Ward Classes</i>	<i>P. & S. Sect. Ward Classes</i> Medicine Orthopaedics Pediatrics	<i>P. & S. Sect. Ward Classes</i> Public Health Nose and Throat	<i>P. & S. Sect. Ward Classes</i> Medicine Proctology Pediatrics	<i>P. & S. Sect. Ward Classes</i> Neurology Roentgenology Psychiatry <i>Amp.</i>	Medical Section Surgical “ Special “
3.30 to 5.00	See special schedule Medical School bulletin board	<i>Univ. Sect. Ward Classes</i> Medicine Proctology Oncology (3.30-4.30) <i>Amp.</i>	<i>Univ. Sect. Ward Classes</i> Public Health Urology <i>Amp.</i> Eye and Ear	<i>Univ. Sect. Ward Classes</i> Therapeutics Nose and Throat	<i>Univ. Sect. Ward Classes</i> Neurology Orthopaedic Surgery (<i>Kernan Hospital</i>) Psychiatry <i>Amp.</i>	Medical Section Surgical “ Special “

(a)—Univ. and P. & S. Sections.

(b)—Univ. Section.

(c)—Whole P. & S. special group.

(d)—P. & S. special group, divided attendance at Univ. and P. & S.

The Senior Class is divided into two sections, which report, one at Lombard and Greene Streets, the other at Calvert and Saratoga Streets, for one semester each, then rotate.

Each section of the class is divided into three groups—Medical, Surgical, and Special. These groups will rotate on the following dates:

First Semester

1st period..... June 25-Aug. 1

2nd period..... Aug. 31-Oct. 3

3rd period..... Oct. 5-Nov. 7

Second Semester

1st period..... Nov. 16-Dec. 19

2nd period..... Dec. 21-Feb. 2

3rd period..... Feb. 3-Mar. 6

C. H.—Chemical Hall—N. E. Cor. Lombard and Greene Streets.

Amp.—Wilson Memorial Amphitheatre—New University Hospital.

Disp. Amp.—Old Hospital Building, fourth floor S. W. cor. Lombard and Greene Streets.

P. & S., 34—Second floor, Calvert and Saratoga Streets.

P. & S., 40, 51—Fourth floor, Calvert and Saratoga Streets.

Univ. Section—Dispensary schedule posted in Old Hospital Bldg.

P. & S. Section—obtain special schedule at Mercy Hospital

Mid-Year Examinations—November 9-14, 1942

Final Examinations—March 8-13, 1943

GRADUATES, MAY 30, 1942

UNIVERSITY OF MARYLAND SCHOOL OF MEDICINE AND
COLLEGE OF PHYSICIANS AND SURGEONS

- Ahroon, William Alstrom, A.B.... Maryland
 Bachrach, David Nathan, Jr., A.B. Maryland
 Baldwin, Earl Rudolph, Jr., B.S. North Carolina
 Barthel, Robert Amthor, Jr., B.S. Maryland
 Bassan, Morton Edward, A.B.... Maryland
 Bennett, Van Boring, A.B.... North Carolina
 Bird, Joseph Gordon, B.S.... Maryland
 Bowen, Francis Dorsey Thomas, B.S. Maryland
 Brodsky, Alexander Emmanuil, B.S. Maryland
 Byerly, William Luther, Jr., B.S. South Carolina
 Carey, Richard Alexius, B.S.... Maryland
 Coffman, Harry Franklin, II West Virginia
 Concilus, Frank, A.B.... Pennsylvania
 Corbett, Sybil, B.S.... Florida
 Cox, Matthew Mordica.... Maryland
 Crane, Warren Eugene.... New Jersey
 Currence, William Ward, B.S. West Virginia
 Davies, Thomas Eugene.... Pennsylvania
 Davila-Lopez, José G., B.S.... Puerto Rico
 Davis, John Russell, Jr., A.B. West Virginia
 Day, Newland Edward.... Maryland
 Dillinger, Karl Anton.... West Virginia
 Dixon, Philip Lafayette, Jr., B.S. North Carolina
 File, Richard Cushing, B.S.... Illinois
 Franz, John Howard, A.B.... Maryland
 Friedman, Marion, B.S.... Maryland
 Fuertes, José Rodriguez, B.S. Puerto Rico
 Furnari, Joseph Charles, B.S. Pennsylvania
 Goldsmith, Jewett, A.B.... Maryland
 Gramse, Arthur Edward, A.B. Massachusetts
 Gregory, Exie Mildred.... West Virginia
 Hamburger, Morton Leonard, B.S. Maryland
 Hubbard, Prevost, Jr., B.S.... New York
 Ingram, Albert Lester, Jr., B.S. Delaware
 Johnson, Hansford Fred, B.S.... Georgia
 Jones, Everett Davis, A.B.... Maryland
 Kardash, Theodore, B.S.... Maryland
 Keeley, Joseph Francis, Jr., A.B. Connecticut
 Kiefer, Robert Allan, A.B.... Maryland
 Klijanowicz, Stanley Benedict, Ph.B. Maryland
 Koleshko, Lawrence Jacob, B.S. Connecticut
 Krepp, Martin William, Jr.... Maryland
 Kroll, John Gregory, A.B.... Pennsylvania
 Kundahl, Paul Charles, B.S.... Maryland
 Link, Etta Carolyn, B.S.... Maryland
 Longwell, Robert Hamiltin, B.S. Pennsylvania
 Lowitz, Irving Robert, B.S.... Maryland
 Manganiello, Louis Otto, A.B. Connecticut
 Marino, Frank Sebastian, A.B. Connecticut
 Mazer, Robert, B.S.... Maryland
 McCosh, James Nathaniel, Jr., B.A. Maryland
 McGoogan, Malcolm Thomas, Jr., B.S. Georgia
 Meli, John James.... Pennsylvania
 Miller, Edgar Allen, Jr., A.B. Pennsylvania
 Moses, Robert Abram, A.B.... Maryland
 Mullins, George Roy, Jr.... West Virginia
 Orofino, Caesar Francis, B.S.... New York
 Osborne, John Carlton, B.S.... Maryland
 Phelan, Patrick Carey, Jr., A.B. Maryland
 Phillips, Otto Charles, A.B.... Maryland
 Posey, Dale Morton, B.S.... Pennsylvania
 Raby, William Thomas, B.S. North Carolina
 Ritchings, Edward Peyton, A.B. Maryland
 Rosin, John David.... Maryland
 Rousos, Anthony Peter, A.B.... New York
 Sadler, Henry Harrison, Jr., A.B. Maryland
 Sadowsky, Wallace Hyman, B.S. Maryland
 Sborofsky, Isadore.... Maryland
 Scholl, Mary Louise Lyons, A.B. Ohio
 Scott, Joseph Whiddon, A.B.... Florida
 Senter, William Jeffress, B.S. North Carolina
 Shipley, Edgar Roderick, A.B.... Maryland
 Shub, Maurice Isaac, A.B.... Maryland
 Shuman, Louis Harry, A.B.... Maryland
 Stegmaier, James George, B.S. Maryland
 Summa, Andrew Anthony James New York
 Townsend, Francis James, A.B. Maryland
 Traynor, Francis Willoughby, B.S. Maryland
 Wallace, Joseph Jr., A.B.... Pennsylvania
 Ward, Charles Monroe, B.S. West Virginia
 Williams, Charles Herman, A.B. Maryland
 Williamson, Edgar Percival, Jr., A.B. Maryland
 Zepp, Edwin Andrew, A.B. West Virginia
 Zimmerman, Loy Miller, B.S.... Maryland

HONORS

UNIVERSITY PRIZE GOLD MEDAL

JOSEPH WHIDDON SCOTT

CERTIFICATES OF HONOR

ALEXANDER EMMANUIL BRODSKY
PATRICK CAREY PHELAN, JR.

JOSEPH GORDON BIRD
ETTA CAROLYN LINK

ANTHONY PETER ROUSOS

The Dr. A. Bardley Gaither Memorial Prize of \$25.00 for the best work in genito-urinary surgery during the senior year.....OTTO CHARLES PHILLIPS

INTERNSHIPS—GRADUATES OF 1942

Effective July 1, 1942

Ahroon, William Alstrom.....Mercy Hospital, Baltimore, Md.
Bachrach, David, Jr.....Church Home & Infirmary, Baltimore, Md.
Baldwin, Earl Rudolph, Jr.....St. Luke's Hospital, Cleveland, Ohio
Barthel, Robert Amthor, Jr.....University Hospital, Baltimore, Md.
Bassan, Morton Edward.....San Francisco General Hospital, San Francisco, Cal.
Bennett, Van Boring.....University Hospital, Baltimore, Md.
Bird, Joseph Gordon.....University Hospital, Baltimore, Md.
Bowen, Francis Dorsey Thomas.....St. Elizabeth's Hospital, Washington, D. C.
Brodsky, Alexander Emmanuil.....Sinai Hospital, Baltimore, Md.
Byerly, William Luther, Jr.....University Hospital, Baltimore, Md.
Carey, Richard Alexius.....University Hospital, Baltimore, Md.
Coffman, Harry Franklin.....Mercy Hospital, Baltimore, Md.
Concilus, Frank.....Medical Center, University of Pittsburgh, Pittsburgh, Pa.
Corbett, SybilHospital for the Women of Maryland, Baltimore, Md.
Cox, Matthew Mordica.....Mercy Hospital, Baltimore, Md.
Crane, Warren Eugene.....St. Francis Hospital, Trenton, N. J.
Currence, William Ward.....Letterman General Hospital, San Francisco, Cal.
Davies, Thomas Eugene.....Mercy Hospital, Baltimore, Md.
Davila-Lopez, José G.....Bayamon Charity District Hospital, Bayamon, P. R.
Davis, John R., Jr.....Mercy Hospital, Baltimore, Md.
Day, Newland Edward.....Union Memorial Hospital, Baltimore, Md.
Dillinger, Karl Anton.....St. Joseph's Hospital, Baltimore, Md.
Dixon, Philip Lafayette, Jr.....James Walker Memorial Hospital, Wilmington, N. C.
File, Richard Cushing.....Reading General Hospital, Reading, Pa.
Franz, John Howard.....University Hospital, Baltimore, Md.
Friedman, Marion.....U.S. Marine Hospital, Norfolk, Va.
Fuertes, Jose Rodriguez.....Presbyterian Hospital, Santurce, P. R.
Furnari, Joseph Charles.....Reading General Hospital, Reading, Pa.
Goldsmith, Jewett.....Kings County Hospital, Brooklyn, N. Y.
Gramse, Arthur Edward.....St. John's Hospital, Brooklyn, N. Y.
Gregory, Exie Mildred.....Hospital for Women of Maryland, Baltimore, Md.
Hamburger, Morton Leonard.....Sinai Hospital, Baltimore, Md.
Hubbard, Prevost, Jr.....French Hospital, New York City
Ingram, Albert Lester, Jr.....Delaware Hospital, Wilmington, Del.
Irwin, Robert Clark.....Newark City Hospital, Newark, N. J.

Johnson, Hansford Fred.....	Henry Ford Hospital, Detroit, Mich.
Jones, Everett Davis.....	Maryland General Hospital, Baltimore, Md.
Kardash, Theodore.....	University Hospital, Baltimore, Md.
Keeley, Joseph Francis, Jr.....	Bridgeport Hospital, Bridgeport, Conn.
Kiefer, Robert Allan.....	Mercy Hospital, Baltimore, Md.
Klijanowicz, Stanley Benedict.....	St. Joseph's Hospital, Baltimore, Md.
Koleshko, Lawrence Jacob.....	Waterbury Hospital, Waterbury, Conn.
Krepp, Martin William, Jr.....	Maryland General Hospital, Baltimore, Md.
Kroll, John Gregory.....	McKeesport Hospital, McKeesport, Pa.
Kundahl, Paul Charles.....	Sibley Memorial Hospital, Washington, D. C.
Link, Etta Carolyn.....	University Hospital, Baltimore, Md.
Longwell, Robert Hamilton.....	Mercy Hospital, Altoona, Pa.
Lowitz, Irving Robert.....	Sinai Hospital, Baltimore, Md.
Manganiello, Louis Otto.....	University Hospital, Baltimore, Md.
Marino, Frank Sebastian.....	St. Francis Hospital, Hartford, Conn.
Mazer, Robert.....	Baltimore City Hospitals, Baltimore, Md.
McCosh, James Nathaniel, Jr.....	Union Memorial Hospital, Baltimore, Md.
McGoogan, Malcolm Thomas, Jr.....	Maryland General Hospital, Baltimore, Md.
Meli, John James.....	Reading Hospital, Reading, Pa.
Miller, Edgar Allen, Jr.....	Mercy Hospital, Pittsburgh, Pa.
Moses, Robert Abram.....	Sinai Hospital, Baltimore, Md.
Mullins, George Roy, Jr.....	Ohio Valley General Hospital, Wheeling, W. Va.
Orofino, Caesar Francis.....	U.S. Naval Hospital
Osborne, John Carlton.....	Mercy Hospital, Baltimore, Md.
Phelan, Patrick Carey, Jr.....	Mercy Hospital, Baltimore, Md.
Phillips, Otto Charles.....	St. Joseph's Hospital, Baltimore, Md.
Posey, Dale Morton.....	St. Joseph's Hospital, Lancaster, Pa.
Raby, William Thomas.....	University Hospital, Baltimore, Md.
Ritchings, Edward Peyton.....	Mercy Hospital, Baltimore, Md.
Rosin, John David.....	University Hospital, Baltimore, Md.
Rousos, Anthony Peter.....	Henry Ford Hospital, Detroit, Mich.
Sadler, Henry Harrison, Jr.....	St. John's Hospital, Brooklyn, N. Y.
Sadowsky, Wallace Hyman.....	Chester Hospital, Chester, Pa.
Sborofsky, Isadore.....	Sinai Hospital, Baltimore, Md.
Scholl, Mary Louise Lyons.....	Medical Center, University of Pittsburgh, Pittsburgh, Pa.
Scott, Joseph Whiddon.....	University Hospital, Iowa City, Iowa
Senter, William Jeffress.....	Grady Hospital, Atlanta, Ga.
Shiple, Edgar Roderick.....	University Hospital, Baltimore, Md.
Shub, Maurice.....	Maryland General Hospital, Baltimore, Md.
Shuman, Louis Harry.....	Los Angeles County General Hospital, Los Angeles, Cal.
Stegmaier, James George.....	Mercy Hospital, Baltimore, Md.
Summa, Andrew Anthony James.....	St. Joseph's Hospital, Syracuse, N. Y.
Townsend, Francis James, Jr.....	Delaware Hospital, Wilmington, Del.
Traynor, Francis Willoughby.....	Maryland General Hospital, Baltimore, Md.
Wallace, Joseph, Jr.....	Abington Memorial Hospital, Abington, Pa.
Ward, Charles Monroe.....	Charleston General Hospital, Charleston, W. Va.
Williams, Charles Herman.....	Maryland General Hospital, Baltimore, Md.
Williamson, Edgar Percival, Jr.....	Baylor University Hospital, Dallas, Tex.
Zepp, Edwin Andrew.....	South Baltimore General Hospital, Baltimore, Md.
Zimmerman, Loy Miller.....	Maryland General Hospital, Baltimore, Md.

MATRICULATES

FOURTH YEAR CLASS 1941-1942

AERON, WILLIAM ALSTROM, A.B., <i>The Johns Hopkins University, 1938</i>	Maryland
BACHARACH, DAVID NATHAN, JR., A.B., <i>St. John's College, 1938</i>	Maryland
BALDWIN, EARL RUDOLPH, JR., B.S., <i>Wake Forest College, 1939; Wake Forest College School of Medical Sciences, 1938-1940</i>	North Carolina
BARTHEL, ROBERT AMTHOR, JR., B.S., <i>University of Maryland, 1939</i>	Maryland
BASSAN, MORTON EDWARD, A.B., <i>The Johns Hopkins University, 1938</i>	Maryland
BENNETT, VAN BORING, A.B., <i>University of North Carolina, 1937</i>	North Carolina
BIRD, JOSEPH GORDON, B.S., <i>Florida Southern College, 1937</i>	Maryland
BOWEN, FRANCIS DORSEY THOMAS, B.S., <i>Villanova College, 1938</i>	Maryland
BRODSKY, ALEXANDER EMMANUIL, B.S., <i>University of Maryland, 1938</i>	Maryland
BYERLY, WILLIAM LUTHER, JR., B.S., <i>University of South Carolina, 1938</i> ..	South Carolina
CAREY, RICHARD ALEXIUS, B.S., <i>Loyola College, 1938</i>	Maryland
COFFMAN, HARRY FRANKLIN, II, A.B., <i>West Virginia University, 1938</i>	West Virginia
CONCILUS, FRANK, A.B., <i>West Virginia University, 1938</i>	Pennsylvania
CORBETT, SYBL, B.S., <i>Florida State College for Women, 1932; University of North Carolina School of Medicine, 1938-1940</i>	Florida
COX, MATTHEW MORDICA, <i>The Johns Hopkins University</i>	Maryland
CRANE, WARREN EUGENE, <i>University of Maryland</i>	New Jersey
CURRENCE, WILLIAM WARD, B.S. in Chemistry, <i>Virginia Military Institute, 1935; B.S., West Virginia University School of Medicine, 1938-1940</i>	West Virginia
DAVIES, THOMAS EUGENE, <i>University of Maryland</i>	Pennsylvania
DAVILA-LOPEZ, JOSÉ G., B.S., <i>University of Puerto Rico, 1938</i>	Puerto Rico
DAVIS, JOHN RUSSELL, JR., A.B., <i>West Virginia University, 1936</i>	West Virginia
DAY, NEWLAND EDWARD, <i>The Johns Hopkins University</i>	Maryland
DILLINGER, KARL ANTON, <i>West Virginia Wesleyan College</i>	West Virginia
DIXON, PHILIP LAFAYETTE, JR., B.S., <i>Wake Forest College, 1939; Wake Forest College School of Medicine, 1938-1940</i>	North Carolina
FILE, RICHARD CUSHING, B.S., <i>Washington and Jefferson College, 1938</i>	Illinois
FRANZ, JOHN HOWARD, A.B., <i>Randolph-Macon College, 1938</i>	Maryland
FRIEDMAN, MARION, B.S., <i>University of Maryland, 1938</i>	Maryland
FUERTES, JOSÉ RODRIGUEZ, B.S., <i>University of Puerto Rico, 1938</i>	Puerto Rico
FURNARI, JOSEPH CHARLES, B.S., <i>University of Pittsburgh, 1938</i>	Pennsylvania
GOLDSMITH, JEWETT, A.B., <i>The Johns Hopkins University, 1938</i>	Maryland
GRAMSE, ARTHUR EDWARD, A.B., <i>Yale University, 1937</i>	Massachusetts
GREGORY, EXIE MILDRED, <i>West Virginia University</i>	West Virginia
HAMBURGER, MORTON LEONARD, B.S., <i>University of Maryland, 1938</i>	Maryland
HUBBARD, PREVOST, JR., B.S., <i>Springfield College, 1938</i>	New York
INGRAM, ALBERT LESTER, JR., B.S., <i>Davidson College, 1938</i>	Delaware
IRWIN, ROBERT CLARK, B.S., <i>University of Maryland, 1939</i>	New Jersey
JOHNSON, HANSFORD FRED, B.S., <i>Wake Forest College, 1938; Wake Forest College School of Medicine, 1938-1940</i>	Georgia
JONES, EVERETT DAVIS, A.B., <i>Western Maryland College, 1938</i>	Maryland
KARDASH, THEODORE, B.S., <i>University of Maryland, 1938</i>	Maryland
KEELEY, JOSEPH FRANCIS, JR., A.B., <i>Harvard College, 1938</i>	Connecticut
KIEFER, ROBERT ALLAN, A.B., <i>Western Maryland College, 1937</i>	Maryland
KLIJANOWICZ, STANLEY BENEDICT, Ph.B., <i>Loyola College, 1938</i>	Maryland
KOLESHKO, LAWRENCE JACOB, B.S., <i>Washington College, 1938</i>	Connecticut
KREPP, MARTIN WILLIAM, JR., <i>University of Maryland</i>	Maryland
KROLL, JOHN GREGORY, A.B., <i>Bethany College, 1938</i>	Pennsylvania
KUNDAHL, PAUL CHARLES, B.S., <i>University of Maryland, 1940</i>	Maryland
LINK, ETTA CAROLYN, B.S., <i>University of Maryland, 1939</i>	Maryland
LONGWELL, ROBERT HAMILTON, B.S., <i>Juniata College, 1938</i>	Pennsylvania
LOWITZ, IRVING ROBERT, B.S., <i>University of Maryland, 1938</i>	Maryland
MANGANIELLO, LOUIS OTTO, A.B., <i>Harvard College, 1937</i>	Connecticut
MARINO, FRANK SEBASTIAN, A.B., <i>Wesleyan College, 1938</i>	Connecticut
MAZER, ROBERT, B.S., <i>University of Maryland, 1938</i>	Maryland
MCCOSH, JAMES NATHANIEL, JR., A.B., <i>The Johns Hopkins University, 1938</i> ..	Maryland
MCGOOGAN, MALCOLM THOMAS, JR., B.S., <i>University of Maryland, 1940</i>	Georgia
MELI, JOHN JAMES, <i>Waynesburg College</i>	Pennsylvania
MILLER, EDGAR ALLEN, JR., A.B., <i>Gettysburg College, 1938</i>	Pennsylvania
MOSES, ROBERT ABRAM, A.B., <i>The Johns Hopkins University, 1938</i>	Maryland
MULLINS, GEORGE ROY, JR., <i>West Virginia University</i>	West Virginia
OROFINO, CAESAR FRANCIS, B.S., <i>University of Maryland, 1939</i>	New York

OSBORNE, JOHN CARLTON, B.S., <i>Loyola College</i> , 1937.....	Maryland
PHELAN, PATRICK CAREY, JR., A.B., <i>Loyola College</i> , 1935.....	Maryland
PHILLIPS, OTTO CHARLES, A.B., <i>The Johns Hopkins University</i> , 1938.....	Maryland
POSEY, DALE MORTON, B.S., <i>Muhlenberg College</i> , 1937.....	Pennsylvania
RABY, WILLIAM THOMAS, B.S., <i>The Citadel</i> , 1938; <i>University of North Carolina School of Medicine</i> , 1938-1940.....	North Carolina
RITCHINGS, EDWARD PEYTON, A.B., <i>St. John's College</i> , 1938.....	Maryland
ROSIN, JOHN DAVID, <i>The Johns Hopkins University</i> , 1938.....	Maryland
ROUSOS, ANTHONY PETER, A.B., <i>Cornell University</i> , 1938.....	New York
SADLER, HENRY HARRISON, JR., A.B., <i>St. John's College</i> , 1938.....	Maryland
SADOWSKY, WALLACE HYMAN, B.S., <i>University of Maryland</i> , 1939.....	Maryland
SBOROFKY, ISADORE, <i>University of Maryland, Johns Hopkins University</i>	Maryland
SCHOLL, MARY LOUISE LYONS, A.B., <i>West Virginia University</i> , 1938; <i>West Virginia School of Medicine</i> , 1938-1939.....	Ohio
SCOTT, JOSEPH WHIDDON, A.B., <i>Duke University</i> , 1938.....	Florida
SENER, WILLIAM JEFFRESS, B.S., <i>Wake Forest College</i> , 1938; <i>Wake Forest College School of Medicine</i> , 1938-1940.....	North Carolina
SHIPLEY, EDGAR RODERICK, A.B., <i>The Johns Hopkins University</i> , 1938.....	Maryland
SHUB, MAURICE ISAAC, A.B., <i>The Johns Hopkins University</i> , 1938.....	Maryland
SHUMAN, LOUIS HARRY, A.B., <i>St. John's College</i> , 1938.....	Maryland
STEGMAIER, JAMES GEORGE, B.S., <i>University of Maryland</i> , 1939.....	Maryland
SUMMA, ANDREW ANTHONY JAMES, A.B., <i>Syracuse University</i> , 1938.....	New York
TOWNSEND, FRANCIS JAMES, A.B., <i>St. John's College</i> , 1938.....	Maryland
TRAYNOR, FRANCIS WILLOUGHBY, B.S., <i>University of Notre Dame</i> , 1937.....	Maryland
WALLACE, JOSEPH JR., A.B., <i>University of Pennsylvania</i> , 1938.....	Pennsylvania
WARD, CHARLES MONROE, B.S., <i>West Virginia Wesleyan College</i> , 1937.....	West Virginia
WILLIAMS, CHARLES HERMAN, A.B., <i>Western Maryland College</i> , 1937.....	Maryland
WILLIAMSON, EDGAR PERCIVAL, JR., A.B., <i>The Transylvania University</i> , 1938.....	Maryland
ZEPP, EDWIN ANDREW, A.B., <i>West Virginia University</i> , 1939; B.S., <i>West Virginia University School of Medicine</i> , 1938-1940.....	West Virginia
ZIMMERMAN, LOY MILLER, B.S., <i>University of Maryland</i> , 1939.....	Maryland

THIRD YEAR CLASS 1941-1942

ADAM, ALBERTO LOTFALLA, <i>Villanova College</i>	Puerto Rico
ADERHOLDT, MARCUS LAFAYETTE, JR., A.B., <i>University of North Carolina</i> , 1937, <i>University of North Carolina School of Medicine</i> 1937-1938, 1939-1941.....	North Carolina
ALLSOPP, RICHARD CHARLES, <i>University of Pittsburgh</i>	Pennsylvania
ALMODOVAR, RAMON IGNACIO, <i>West Virginia University</i>	Puerto Rico
BAKER, EMORY FORESTER, A.B., <i>Stanford University</i> , 1939.....	Washington
BARNES, JOHN DAVID, A.B., <i>Harvard University</i> , 1937.....	Massachusetts
BERRY, ROBERT ZINN, A.B., <i>West Virginia University</i> , 1939; B.S. <i>West Virginia University School of Medicine</i> , 1939-1941.....	West Virginia
BIZZELL, JAMES WOOTEN, B.S., <i>Wake Forest College</i> , 1939; <i>Wake Forest College School of Medicine</i> , 1939-1941.....	North Carolina
BOWEN, CHARLES VERNON, JR., B.S., <i>University of Maryland</i> , 1939.....	Maryland
BRENNAN, THOMAS JOSEPH, B.S., <i>Loyola College</i> , 1939.....	Maryland
BRINTON, SHERMAN SIMONS, A.B., <i>University of Utah</i> , 1940; <i>University of Utah School of Medicine</i> , 1939-1941.....	Utah
BROOKS, RALPH KING, A.B., <i>West Virginia University</i> , 1939.....	West Virginia
BROOKS, ROSS CHILTON, B.S., <i>Loyola College</i> , 1939.....	Maryland
BRYSON, WILLIAM JAMES, A.B., <i>Western Maryland College</i> , 1939.....	Maryland
CHENOWITH, RALPH STALLINGS, <i>University of Maryland School of Pharmacy; Loyola College</i>	Maryland
COHEN, HARRY, B.S., <i>University of Maryland</i> , 1939.....	Maryland
COUGHLIN, JOHN BENEDICT, B.S., <i>Niagara University</i> , 1939.....	Pennsylvania
COURTNEY, DONALD LAWRENCE, <i>University of Oregon</i>	Oregon
CRASTNAPOL, PHILIP, B.S., <i>University of Maryland</i> , 1938.....	New Jersey
CUSANI, BENEDICT ALBERT, B.S., <i>Villanova College</i> , 1939.....	Florida
DALMÁU, MIGUEL SEBASTIAN, B.S., <i>University of Puerto Rico</i> , 1939.....	Puerto Rico
DAVIS, WILLIAM JOSEPH GRAHAM, A.B., <i>University of North Carolina</i> , 1939.....	District of Columbia

- DIORIO, JOHN DANIEL, B.S., *Mount St. Mary's College*, 1939..... Connecticut
- DUNNE, THOMAS BENJAMIN, A.B., *The Johns Hopkins University*, 1939..... New York
- EATON, WILLIAM ROBERT, A.B., *St. John's College*, 1936..... Maryland
- EPPELSON, JOHN WALLACE WALKER, B.S., *University of Maryland*, 1941..... Maryland
- FOWLER, RICHARD LOWMAN, B.S., *The Citadel*, 1938..... North Carolina
- FRENCH, SAMUEL LAWSON, A.B., *American University*, 1935..... Maryland
- FRIEDMAN, PAUL NORMAN, A.B., *The Johns Hopkins University*, 1939..... Maryland
- GARRISON, ALFRED SELMAN, A.B., *Western Maryland College*, 1940..... Maryland
- GIGLIA, TONY ROBERT, JR., A.B., *West Virginia University*, 1939..... West Virginia
- GOLDBERG, RAYMOND BERNARD, A.B., *The Johns Hopkins University*, 1935..... Maryland
- GRAVE DE PERALTA, JOSÉ IGNACIO, B.S., *University of Maryland*, 1939..... Cuba
- GRAY, DAVID BENONI, B.S., *West Virginia Wesleyan College*, 1938..... West Virginia
- HAGAN, WILLIAM BAKER, B.S., *University of Maryland*, 1941..... Maryland
- HASSLER, FRANK STANLEY, III, A.B., *University of Pennsylvania*, 1939..... Pennsylvania
- HONIGMAN, ALVIN HERBERT, B.S., *University of Maryland*, 1939..... Maryland
- HUNT, WILLIAM JACK, B.S., *Wake Forest College*, 1939; *Wake Forest College School of Medicine*, 1939-1941..... North Carolina
- JENKINS, WILLIAM ROMULUS, B.S., *The Citadel*, 1938; *University of North Carolina School of Medicine*, 1939-1941..... North Carolina
- KEADLE, ROBERT FRANKLIN, B.S., *University of North Carolina*, 1940; *University of North Carolina School of Medicine*, 1939-1941..... Maryland
- LA MAR, ROBERT CHARLES, JR., *Goshen College*..... Maryland
- LEE, FERDINAND WAYNE, A.B., *West Virginia University*, 1940; *West Virginia University School of Medicine*, 1939-1941..... West Virginia
- LEWIS, RICHARD CHARLES, A.B., *Duke University*, 1939..... Maryland
- LIVINGSTONE, ROBERT CHARLES, A.B., *West Virginia University*, 1939..... West Virginia
- LUKATS, PAUL GEORGE, *University of Akron*..... Ohio
- MACDONALD, CHARLES RENWICK, B.S., *University of Maryland*, 1941..... Maryland
- MATCHAR, JOSEPH CHARLES, A.B., *The Johns Hopkins University*, 1939..... Maryland
- McMILLAN, MARCY EMORY, JR., *West Virginia University*..... West Virginia
- MELE, VINCENT JAMES, JR., B.S., *Selon Hall College*, 1937..... New Jersey
- MÉNDEZ, NÉSTOR HERNÁN, B.S., *University of Puerto Rico*, 1939..... Puerto Rico
- MILLER, JAMES DELMAR, A.B., *Ohio State University*, 1939..... Ohio
- MINERVINI, ROBERT VIRGINIUS, A.B., *Columbia University*, 1938..... New York
- MORRIS, JOHN DAVIS, A.B., *West Virginia University*, 1940; *West Virginia University School of Medicine*, 1939-1941..... West Virginia
- MUSNICK, HENRY, A.B., *The Johns Hopkins University*, 1939..... Maryland
- MYERS, JOSEPH CARL, A.B., *Western Maryland College*, 1939..... Maryland
- NASH, KENNETH POWELL, *University of California*, 1939..... California
- NEFF, CHARLES AMOS, A.B., *Goshen College*, 1938..... Illinois
- PARÉS, MARIA AMALIA, B.S., *University of Puerto Rico*, 1939..... Puerto Rico
- PARROTT, FRANK STRONG, B.S., *Wake Forest College*, 1939; *Wake Forest College School of Medicine*, 1939-1941..... North Carolina
- PEREZ, ENRIQUE, A.B., *New York University*, 1939..... Puerto Rico
- PERRY, HENRY BAKER, JR., *Wake Forest College*, 1940; *Wake Forest College School of Medicine*, 1939-1941..... North Carolina
- PETERSON, PRESTON HORSLEY, *University of Utah*..... Utah
- QUEEN, JOSEPH EMMETT, A.B., *Loyola College*, 1939..... Maryland
- RANGLE, RAYMOND VETO, B.S., *University of Maryland*, 1941..... Maryland
- RENSHAW, JOSEPHINE ELIZABETH, B.S., *University of Wisconsin*, 1932; *M.S., Wellesley College*, 1933..... Maryland
- RICHARDS, GRANVILLE HAMPTON, A.B., *Franklin and Marshall College*, 1939..... Maryland
- ROBBINS, MARTIN ALBERT, A.B., *The Johns Hopkins University*, 1939..... Maryland
- ROSENSTEIN, LOUIS NATHAN, B.S., *University of Maryland*, 1939..... Maryland
- ROYER, EARL LINWOOD, *The Johns Hopkins University*; A.B., *Bridgewater College*, 1941..... Maryland
- RUDE, RICHARD SPROGOE, *Washington and Lee University*..... New Jersey
- SACKS, SEYMOUR, A.B., *The Johns Hopkins University*, 1939..... Maryland
- SAMUELS, IRVING LEONARD, A.B., *Duke University*, 1939..... Maryland
- SHARP, NATHANIEL, *University of Maryland School of Pharmacy*; *Loyola College*..... Maryland
- SIGLER, JOHN WILTSHIRE, A.B., *Ohio State University*, 1939..... Ohio
- SOLER-FAVALE, MARTA EMILIA, B.S., *University of Puerto Rico*, 1939..... Puerto Rico

SPIER, ANDREW ALLAN, A.B., <i>The Johns Hopkins University</i> , 1939.....	Maryland
STAFFORD, HAROLD REELLINGER, <i>Juniata College</i>	Michigan
STEWART, EDWIN HARVEY, JR., <i>The Johns Hopkins University</i>	Maryland
STIER, HOWARD WILLIAM, A.B., <i>The Johns Hopkins University</i> , 1939.....	New Jersey
STONER, JAMES ERNEST, JR., A.B., <i>Western Maryland College</i> , 1939.....	Maryland
TAYLOR, IRVING JULIAN, A.B., <i>The Johns Hopkins University</i> , 1939.....	Maryland
TORRES, JOSÉ MANUEL, B.S., <i>Manhattan College</i> , 1939.....	Puerto Rico
TRADER, CHARLES WELDON, A.B., <i>Western Maryland College</i> , 1939.....	Maryland
TUNNEY, ROBERT BOONE, B.S., <i>Loyola College</i> , 1939.....	Maryland
VAN LILL, STEPHEN JOSEPH, III, A.B., <i>Duke University</i> , 1938.....	Maryland
VARHOL, JOSEPH GREGORY, JR., B.S., <i>Rutgers University</i> , 1939.....	New Jersey
WACHSMAN, IRVIN LOUIS, <i>University of Maryland, Johns Hopkins University</i>	Maryland
WALKER, SAMUEL HAYWOOD, B.S., <i>Davidson College</i> , 1939.....	North Carolina
WARREN, FRANK ORVILLE, JR., <i>University of New Hampshire</i>	New Hampshire
WEBSTER, THOMAS CLYDE, <i>University of Maryland School of Pharmacy; Loyola College</i>	Maryland
WEISS, MAURICE RICHARD, <i>University of Pittsburgh</i>	Pennsylvania
WICH, JOSEPH CARLTON, <i>University of Maryland School of Pharmacy; Loyola College</i>	Maryland
WILLIAMSON, OLIVER WAYNE, B.S., <i>University of North Carolina</i> , 1940; <i>University of North Carolina School of Medicine</i> , 1939-1941.....	North Carolina
WILSON, THOMAS LESLIE, <i>University of Maryland</i>	Maryland
WISE, ROBERT EDWARD, <i>University of Pittsburgh</i>	Pennsylvania
WOODY, ARTHUR OVERTON, <i>Duke University</i>	Maryland
WORGAN, DAVID KUYKENDALL, B.S., <i>University of Maryland</i> , 1941.....	Maryland
YURKO, LEONARD EMORY, A.B., <i>West Virginia University</i> , 1939.....	West Virginia

SECOND YEAR CLASS 1941-1942

ACTON, ELIZABETH, A.B., <i>American University</i> , 1940.....	New Jersey
BALDWIN, RUTH WORKMAN, <i>University of Maryland</i>	Illinois
BALLARD, WILLIAM RILEY, JR., A.B., <i>West Virginia University</i> , 1940.....	West Virginia
BENNETT, LILLIAN FEYKERT, A.B., M.A., <i>University of California</i> , 1938, 1939.....	California
BERRY, HERBERT LEE, <i>University of Southern California</i>	Arizona
BITSACK, JOSEPH WILLIAM, A.B., <i>The Johns Hopkins University</i> , 1940.....	New Jersey
BRANDT, FREDERICK BERTRAM, <i>University of Maryland</i>	District of Columbia
BROBST, HENRY THOMAS, A.B., <i>Oberlin College</i> , 1940.....	Pennsylvania
BROWN, CHARLES WILLIAM, A.B., <i>West Virginia University</i> , 1940.....	Pennsylvania
BROWN, JAMES MACK, A.B., <i>University of Alabama</i> , 1940.....	Alabama
COLON-YORDAN, ERNESTO, A.B., <i>University of Puerto Rico</i> , 1940.....	Puerto Rico
COOK, ELMER ELLSWORTH, JR., <i>University of Maryland</i>	Maryland
CORPENING, WILLIAM, A.B., <i>University of North Carolina</i> , 1940.....	North Carolina
CROSBY, ROBERT MACGONIGLE NELSON, <i>The Johns Hopkins University</i>	Maryland
CURTISS, ROBERT KIMBER, A.B., <i>Colgate University</i> , 1940.....	New York
DANN, ALFRED HENRY, A.B., <i>The Johns Hopkins University</i> , 1940.....	Maryland
DAY, EDWARD COLSON, A.B., <i>College of Wooster</i> , 1939.....	New York
DILLON, HAROLD, B.S., <i>University of Maryland</i> , 1940.....	Maryland
DORMAN, HAMILTON PEACOCK, B.S., <i>Bates College</i> , 1940.....	District of Columbia
DOYLE, JOHN JUSTIN, B.S., <i>Boston College</i> , 1940.....	Massachusetts
EHRLICH, DANIEL, A.B., <i>The Johns Hopkins University</i> , 1940.....	Maryland
FERRI, HENRY GUY, B.S., <i>University of Pittsburgh</i> , 1940.....	Pennsylvania
FINEGOLD, AARON NATHAN, B.S., <i>University of Pittsburgh</i> , 1940.....	Pennsylvania
FRYE, AUGUSTUS HOMER, JR., B.S., <i>University of Georgia</i> , 1939.....	Georgia
GALITZ, ELI, A.B., <i>New York University</i> , 1939.....	New York
GARRETT, RICHARD MITCHELL, <i>Emory University</i>	Alabama
GUBNITSKY, ALBERT, B.S., <i>University of Maryland</i> , 1940.....	Maryland
GUYTHER, JOSEPH ROY, <i>University of Maryland</i>	Maryland
HARRIS, WILLIAM MYRICK, <i>West Virginia University</i>	Maryland
HAUGHT, JOHN STEVENSON, <i>West Virginia University</i>	West Virginia
IGUINA-JIMENEZ, MANUEL ANTONIO, <i>University of Puerto Rico</i>	Puerto Rico
INGENITO, GABRIEL ANDREW, A.B., <i>University of Connecticut</i> , 1940.....	Connecticut
INGRAM, CHARLES HAL, A.B., <i>Duke University</i> , 1940.....	North Carolina
ISALES, LUIS MANUEL, B.S., <i>University of Puerto Rico</i> , 1939.....	Puerto Rico

JAWORSKI, MELVIN JOSEPH, <i>B.S., University of Maryland, 1940.</i>	Maryland
KEENEY, DAN FRANKLIN, <i>University of Maryland.</i>	Maryland
KEMPER, CHARLES ALEXANDER, <i>A.B., Duke University, 1940.</i>	Maryland
KINNEY, EARL RAY, <i>A.B., University of Kansas, 1940.</i>	West Virginia
KLEIMAN, ALLEN, <i>A.B., The Johns Hopkins University, 1940.</i>	Maryland
LATIMER, CLARENCE VINETTE, JR., <i>A.B., Duke University, 1940.</i>	New York
LURTING, FREDERICK WILBUR, <i>B.S., University of Pittsburgh, 1940.</i>	Pennsylvania
MAMULA, PETER, <i>A.B., West Virginia University, 1940.</i>	West Virginia
MARKOWITZ, ARNOLD ROBERT, <i>A.B., West Virginia University, 1940.</i>	West Virginia
MCCORMACK, LLOYD LEO, <i>University of Virginia.</i>	New Jersey
McFADDEN, ROBERT BURNS, <i>B.S., Loyola College, 1940.</i>	Maryland
McGRATH, WILLIAM EDWARD, JR., <i>A.B., Loyola College, 1939.</i>	Maryland
McMULLIN, JOSEPH FREDERICK, <i>A.B., Ohio University, 1938.</i>	Pennsylvania
MEADE, DeVoe KEPLER, <i>B.S., University of Maryland, 1940.</i>	Maryland
MIRANDA, ANGEL NEFTALI, <i>University of Puerto Rico.</i>	Puerto Rico
MORGAN, JACK CALVIN, <i>A.B., West Virginia University, 1940.</i>	West Virginia
MYERS, MYRON JOSEPH, <i>A.B., The Johns Hopkins University, 1940.</i>	Maryland
NELSON, ALFRED TURNER, <i>University of Michigan.</i>	Maryland
OZAZEWski, JOHN CASIMIR, <i>B.S., Loyola College, 1940.</i>	Maryland
PALESE, JOHN MICHAEL, <i>University of Maryland.</i>	Maryland
PETERS ROBERT JOSEPH, <i>West Virginia University.</i>	Pennsylvania
PFEIL, EDGAR THORNTON, <i>University of Maryland.</i>	Maryland
PINAS, SAMUEL RONALD, <i>B.S., University of Maryland, 1940.</i>	Maryland
POMEROV, WILLIAM HENRY, II, <i>B.S., Trinity College, 1938.</i>	Connecticut
RAFFUCCI-ARCE, FRANCISCO LUIS, <i>University of Puerto Rico.</i>	Puerto Rico
RANGE, JAMES JACOB, <i>A.B., Duke University, 1940.</i>	Tennessee
RATLIFF, CLIFF, JR., <i>A.B., Duke University, 1940.</i>	North Carolina
REAM, NORMAN, B., <i>B.S., Franklin and Marshall College, 1940.</i>	Pennsylvania
RECHT, JOHN MUNN, <i>A.B., Gettysburg College, 1940.</i>	New Jersey
RINEHART, ARTHUR MIDDLETON, <i>B.S., Trinity College, 1940.</i>	Maryland
ROBERTSON, MERRITT EZEKIEL, <i>A.B., Tusculum College, 1940.</i>	North Carolina
ROGERS, GEORGE CARRAWAY, <i>A.B., University of North Carolina, 1939.</i>	North Carolina
ROGERS, WILLIAM BRANNON, JR., <i>B.S., University of Akron, 1940.</i>	Ohio
SANTIAGO, STEVENSON PARKER, <i>A.B., Maryville College, 1940.</i>	Puerto Rico
SAPARETO, ROCCO LOUIS, <i>B.S., Tufts College, 1939.</i>	Massachusetts
SCHERLIS, IRVING, <i>A.B., The Johns Hopkins University, 1940.</i>	Maryland
SHIPLEY, FRANK MOLLMAN, <i>A.B., Western Maryland College, 1940.</i>	Maryland
SHORTLE, JAMES SAMUEL, <i>B.S., University of New Mexico, 1939.</i>	New Mexico
SONES, FRANK MASON, JR., <i>A.B., Western Maryland College, 1940.</i>	Maryland
STERLING, HAROLD, <i>B.S., University of Maryland, 1940.</i>	District of Columbia
STROBEL, MARTIN EDWARD, <i>A.B., Gettysburg College, 1940.</i>	Maryland
SUMMERLIN, GLENN OLSON, <i>Emory University.</i>	Florida
THOMPSON, TALMADGE STANLEY, <i>University of Maryland.</i>	Maryland
TILT, LEROY WORTENDYKE, JR., <i>A.B., Oberlin College, 1939.</i>	Maryland
UBIDES, PEDRO FEDERICO, <i>B.S., University of Maryland, 1940.</i>	Puerto Rico
VARGAS, DHARMA LUZ, <i>B.S., University of Puerto Rico, 1940.</i>	Puerto Rico
WALDROP, GRAYSON SPENCER, <i>A.B., University of North Carolina, 1940.</i>	North Carolina
WALKUP, HARRY ERNEST, <i>West Virginia University.</i>	West Virginia
WEST, GEORGE BROOKS, JR., <i>B.S., College of William and Mary, 1940.</i>	Virginia
WILL, DAVID REID, <i>Ohio State University.</i>	Ohio
WILLIAMS, THOMAS RICHARD, JR., <i>A.B., Duke University, 1940.</i>	North Carolina
ZIEGLER, PAUL RANDALL, <i>University of Maryland.</i>	Maryland

FIRST YEAR CLASS 1941-1942

ALVAREZ, JOSÉ ALBERTO, <i>University of Puerto Rico.</i>	Puerto Rico
ANCHELL, MELVIN, <i>B.S., University of Maryland, 1941.</i>	Maryland
ARDINGER, JOSEPH STANLEY, JR., <i>University of Maryland.</i>	Maryland
BACON, ARTHUR MAYNARD, JR., <i>B.S., Loyola College, 1941.</i>	Maryland
BELL, HOUSTON LESHNER, <i>University of Maryland.</i>	Maryland
BLACK, WILLIAM POLLOCK, JR., <i>University of Maryland.</i>	West Virginia
BLOXOM, JOHN MADISON, III, <i>B.S., University of Virginia, 1941.</i>	Virginia
BRADY, CHARLES ELDON, <i>A.B., University of North Carolina, 1939.</i>	North Carolina
BRADY, FRANK JOSEPH, <i>B.S., Washington College, 1941.</i>	Maryland

BRANDES, HERBERT GIBBS, <i>University of Maryland</i>	District of Columbia
BRILL, WARREN DANIEL, <i>B.S., University of Maryland, 1941</i>	Maryland
BROWN, RICHARD JAMES, <i>University of Maryland</i>	Connecticut
BUCKEY, ROBERT BRUCE, <i>A.B., University of New Mexico, 1941</i>	Maryland
CADDEN, JOHN JOSEPH, <i>A.B., St. Mary's College, 1932</i>	Maryland
CALLAHAN, DANIEL HARRY, JR., <i>B.S., Bowdoin College, 1941</i>	Massachusetts
CARR, CHARLES EDWIN, JR., <i>B.S., Loyola College, 1941</i>	Maryland
CHAPUT, CHARLES DUPE, <i>A.B., Dartmouth College, 1941</i>	Massachusetts
CINTRON, MIGUEL A., <i>West Virginia University</i>	Puerto Rico
CLONINGER, ROWELL CONNOR, <i>A.B., Lenoir Rhyne College, 1942</i>	North Carolina
COPELAND, HERBERT BERNARD, JR., <i>West Virginia University</i>	West Virginia
COWLEY, R. ADAMS, <i>University of Utah</i>	Utah
DODD, PATRICIA, <i>University of Maryland</i>	Georgia
DOUKAS, JAMES A., <i>B.S., Washington College, 1941</i>	Maryland
DRAKE, MILES EDWARD, <i>B.S., Oregon State College, 1933; M.S., Oregon State College, 1934; Ph. D., University of Southern California, 1938</i>	Maryland
EBELING, WILLIAM CARL, III, <i>University of Maryland</i>	Maryland
ELIAS, THOMAS GLENN, <i>A.B., Western Maryland College, 1941</i>	Maryland
EVERETT, JOHN THOMAS, <i>B.S., Mt. St. Mary's College, 1941</i>	Maryland
FARKAS, ROBERT WILLIAM, <i>A.B., University of Maryland, 1941</i>	Pennsylvania
FEASTER, JAMES HENRY, JR., <i>A.B., West Virginia University, 1941</i>	West Virginia
FELDMAN, MAURICE, JR., <i>A.B., The Johns Hopkins University, 1941</i>	Maryland
FOARD, WILBUR HARPER, <i>Asbury College</i>	Maryland
FRANCE, GERMANUS JOHN, <i>B.S., Loyola College, 1941</i>	Maryland
FRIDL, JOSEPH WARREN, <i>B.S., Loyola College, 1941</i>	Maryland
FUTTERMAN, PERRY, <i>A.B., The Johns Hopkins University, 1941</i>	Maryland
GARCIA Y GARCIA, JOSÉ ANTONIO, <i>B.S., University of Puerto Rico, 1941</i>	Puerto Rico
GASSAWAY, FRANKLYN DRENNAN, <i>University of Maryland</i>	Arizona
GLOVER, ALBERT JEROME, <i>B.S., Washington College, 1929</i>	Maryland
GODLOVE, JOHN CARLTON, <i>A.B., Dickinson College, 1933</i>	Maryland
GOLDSTEIN, MARVIN, <i>A.B., The Johns Hopkins University, 1941</i>	Maryland
GRUMBINE, FRANCIS LEVINE, <i>A.B., Western Maryland College, 1941</i>	Maryland
GUTHRIE, WILLIAM WILKINSON, <i>A.B., University of Pennsylvania, 1941</i>	West Virginia
HAMILL, JAMES EDWARD, <i>B.S., University of Maryland, 1941</i>	Maryland
HARMAN, ROY SAMUEL, <i>A.B., West Virginia University, 1941</i>	West Virginia
HAYDEN, RICHARD CARROLL, <i>University of Maryland</i>	Maryland
HEROLD, PAUL GARMER, <i>Duke University</i>	Maryland
¹ HERRMANN, ALBERT CASPER, <i>University of Maryland</i>	Maryland
HOBELMANN, CHARLES FREDERICK, <i>A.B., The Johns Hopkins University, 1941</i>	Maryland
HOLLIES, HENRY WIRT DUVAL, <i>A.B., Western Maryland College, 1941</i>	Maryland
HORN, HELEN AMELIA, <i>A.B., Goucher College, 1941</i>	Maryland
HOUSKA, HENRY JOHN, <i>A.B., Loyola College, 1941</i>	Maryland
INGRAM, PHYLIS RAY, <i>University of Vermont</i>	Maryland
JERNIGAN, JOHN MAYO, JR., <i>B.S., University of Maryland, 1941</i>	Maryland
JONES, BOBBY LEE, <i>B.S., University of Maryland, 1941</i>	Maryland
KISHPAUGH, MARJORIE BIRD, <i>B.S., Lebanon Valley College, 1941</i>	Pennsylvania
KOON, CHARLES HERBERT, <i>West Virginia University</i>	West Virginia
KREIS, GEORGE JOSEPH, JR., <i>B.S., University of Maryland, 1941</i>	Maryland
LAMBERT, HERMAN JAMES, JR., <i>B.S., University of Hawaii, 1941</i>	Georgia
LAMPLEY, WILLIAM ASKEW, <i>B.S., Furman University, 1941</i>	North Carolina
LAWSON, MARION EDWARD, <i>B.S., Furman University, 1941</i>	South Carolina
LERMAN, PHILIP H., <i>B.S., University of Maryland, 1940</i>	Maryland
LEVINE, STUART CHARLES, <i>B.S., University of Maryland, 1941</i>	Maryland
LITTLEFIELD, JAMES BEATON, <i>A.B., University of Virginia, 1941</i>	Massachusetts
LOHAN, JUNIE BROOKS, <i>B.S., West Virginia Wesleyan College, 1941</i>	West Virginia
LORD, HARRISON LUTHER, <i>University of Maryland</i>	Maryland
¹ MACONACHY, WILLIAM VICTOR, JR., <i>B.S., Loyola College, 1941</i>	Maryland
MAXWELL, GEORGE ALEXANDER, JR., <i>University of Maryland</i>	Maryland
MILLOFF, BERNARD, <i>B.S., University of Maryland, 1941</i>	Maryland
MINTZER, DONALD WILLIS, <i>University of Maryland</i>	New Jersey
MOSBERG, WILLIAM HENRY, JR., <i>University of Maryland</i>	Maryland

¹ Did not complete the year—illness.

NELLER, WALTER IRVING, JR., <i>University of Virginia</i>	New York
NORMENT, RICHARD BAXTER, III, <i>University of Maryland</i>	Maryland
O'DONNELL, CHARLES FRANCIS, <i>The Johns Hopkins University</i>	Maryland
OSBORNE, WILLIAM WILSON, <i>University of Georgia</i>	Georgia
PATTERSON, CARL NORRIS, B.S., <i>Franklin and Marshall College, 1941</i>	Maryland
PIERPONT, EDWIN LOWELL, <i>University of Maryland</i>	Maryland
POOL, CHAMPE CLARK, A.B., <i>West Virginia University, 1941</i>	West Virginia
PRATT, LOUIS JOHN, B.S., <i>Loyola College, 1941</i>	Maryland
RAMUNDO, MICHAEL RAYMOND, A.B., <i>Syracuse University, 1941</i>	New Jersey
RANDOLPH, EDWARD BURL, <i>West Virginia University</i>	West Virginia
REES, DAVID THOMAS, A.B., <i>West Virginia University, 1938</i>	Pennsylvania
RILEY, EUGENE JOHN, <i>University of Maryland</i>	Maryland
ROBBINS, MORRIS ALLEN, A.B., <i>University of Pennsylvania, 1941</i>	New Jersey
ROLFES, HARRY FRANKLIN, <i>University of Maryland</i>	Maryland
RUENESTONE, ALBERT IRVING, A.B., <i>University of Pennsylvania, 1941</i>	Maryland
SCAVONE, EDMOND, B.S., <i>Loyola College, 1941</i>	Maryland
SCHWARTZ, AARON DAVID, A.B., <i>University of Pennsylvania, 1941</i>	New York
SEABRIGHT, HOWARD LEE, A.B., <i>Washington and Jefferson College, 1941</i>	West Virginia
SHAW, CHARLES EDWARD, JR., <i>University of Maryland</i>	Maryland
SIMONS, GEORGE MURRAY, <i>University of Maryland</i>	Maryland
SMITH, EDWARD WHITTINGHAM, JR., B.S., <i>Loyola College, 1941</i>	Maryland
SPELSBERG, WALTER KARL, <i>University of Maryland</i>	West Virginia
STEINBERG, STANLEY HERBERT, <i>University of Maryland</i>	District of Columbia
STICHEL, FREDERICK LOUIS, JR., <i>University of Maryland</i>	Maryland
THOMPSON, LEWIS BRADFORD, <i>Dartmouth College</i>	Massachusetts
TINKER, FRANCIS PAUL, B.S., <i>Loyola College, 1941</i>	Maryland
TRABAND, MILLARD TOLSON, JR., B.S., <i>University of Maryland, 1937</i>	Maryland
TURNER, ROY BYRON, JR., <i>University of Maryland</i>	District of Columbia
TWEED, RUMBROUGH CHAPPEL, A.B., <i>Emory University, 1941</i>	Florida
ULLSPERGER, JOHN FRANCIS, A.B., <i>Loyola College, 1941</i>	Maryland
WEHLING, BENJAMIN BIRD, B.S., <i>Wheaton College, 1941</i>	Ohio
WILSON, MARY STUART, A.B., <i>Randolph-Macon College, 1941</i>	Maryland
WOODEN, ALLEN CURTIS, B.S., <i>Wake Forest College, 1941</i>	Maryland
WOODRUM, OLIN C., <i>The Johns Hopkins University</i>	Maryland
YAFFE, STANLEY NORMAN, B.S., <i>University of Maryland, 1941</i>	Maryland

STUDENTS IN ART AS APPLIED TO MEDICINE

ELIZABETH S. CONE	Maryland
VIRGINIA WOODLAND	Maryland
RUTH CORDISH	Maryland
PHILLIS J. ANDERSON	Maryland
ALICE E. ZEIGLER	Maryland
AGNES M. ROBERGE	Canada

SUMMARY OF STUDENTS, 1941-1942

<i>Medical Students</i>	<i>Men</i>	<i>Women</i>	<i>Total</i>
Senior	81	4	85
Junior	95	3	98
Sophomore	82	4	86
Freshmen	97*	5	102
	355	16	371
Withdrawal *2	2	0	2
	357	16	373
<i>Students in Art as Applied to Medicine</i>	0	6	6
	357	22	379

GEOGRAPHICAL DISTRIBUTION OF STUDENTS, 1941-1942

Alabama.....	2	North Carolina.....	24
Arizona.....	2	Ohio.....	8
California.....	2	Oregon.....	1
Connecticut.....	8	Pennsylvania.....	25
Delaware.....	1	South Carolina.....	2
District of Columbia.....	6	Tennessee.....	1
Florida.....	5	Utah.....	3
Georgia.....	6	Virginia.....	2
Illinois.....	3	Washington.....	2
Maryland (Baltimore 106).....	175	West Virginia.....	34
Massachusetts.....	8		
Michigan.....	1		
New Hampshire.....	1		
New Jersey.....	14		
New Mexico.....	1		
New York.....	11		

FOREIGN

China.....	1
Cuba.....	1
Puerto Rico.....	21

LIST OF COLLEGE SOURCES OF STUDENTS ENROLLED DURING 1941-1942*

Akron University.....	2	Loyola College.....	28
Alabama, University of.....	1	Manhattan College.....	1
American University.....	2	Maryland, University of.....	89
Antioch College.....	2	Maryville College.....	1
Asbury College.....	1	Michigan, University of.....	2
Bates College.....	1	Mount St. Mary's College.....	2
Bethany College.....	1	Muhlenberg College.....	1
Boston College.....	1	New Hampshire, Univ. of.....	1
Boston University.....	1	New Mexico, University of.....	2
Bowdoin College.....	1	New York University.....	9
California, University of.....	3	Niagara University.....	1
Citadel, The.....	3	North Carolina, University of.....	9
Colgate University.....	1	Notre Dame, University of.....	2
Columbia University.....	1	Oberlin College.....	1
Connecticut, University of.....	2	Ohio State University.....	4
Cornell University.....	2	Ohio University.....	1
Dartmouth College.....	2	Oregon State College.....	1
Davidson College.....	2	Oregon, University of.....	1
Dickinson College.....	2	Pennsylvania, University of.....	9
Duke University.....	16	Pittsburgh, University of.....	7
Emory University.....	4	Puerto Rico, Polytechnic Inst. of.....	1
Florida Southern College.....	1	Puerto Rico, University of.....	19
Florida State College.....	1	Randolph Macon College.....	2
Franklin and Marshall College.....	3	Rutgers University.....	1
Furman University.....	2	St. John's College.....	6
Georgia, University of.....	3	St. Mary's College.....	1
Gettysburg College.....	3	Seton Hall College.....	1
Goshen College.....	3	South Carolina, University of.....	1
Goucher College.....	1	Southern California, Univ. of.....	4
Harvard College.....	6	Springfield College.....	3
Hawaii, University of.....	1	Syracuse, University of.....	1
Johns Hopkins University.....	48	Transylvania College.....	1
Juniata College.....	2	Trinity College.....	2
Kansas, University of.....	1	Tufts College.....	3
Lebanon Valley College.....	1	Tusculum College.....	2
Lenoir Rhyne College.....	1	Utah, University of.....	1

* Totals exceed student total because of multiple college attendance.

Vermont, University of.....	1	Wesleyan College.....	1
Villanova College.....	3	Western Maryland College.....	13
Virginia Military Institute.....	1	West Virginia University.....	30
Virginia, University of.....	8	West Virginia Wesleyan College.....	6
Wake Forest College.....	5	Wheaton College.....	1
Washington College.....	6	William and Mary, College of.....	1
Washington and Jefferson Coll.....	4	Wisconsin, University of.....	1
Washington and Lee Univ.....	1	Wooster, College of.....	1
Waynesburg College.....	2	Yale University.....	1
Wellesley College.....	2		

MEDICAL ALUMNI ASSOCIATION

OFFICERS, 1942-1943

(Term beginning July 1, 1942, and ending June 30, 1943)

President

HENRY J. WALTON, M.D.

Vice-Presidents

REAR ADMIRAL CHARLES H. T. LOWNDES

J. WALTER LAYMAN, M.D.

FREDERICK W. STEINER, M.D.

Secretary

BENJAMIN S. RICH, M.D.

Assistant Secretary

KENNETH LEGGE, M.D.

Treasurer

EDWARD P. SMITH, M.D.

Board of Directors★WALTER D. WISE, M.D., *Chairman*

HENRY J. WALTON, M.D.

EDGAR B. FRIEDENWALD, M.D.

BENJAMIN S. RICH, M.D.

GEORGE MCLEAN, M.D.

WILLIAM H. SMITH, M.D.

EDWARD P. SMITH, M.D.

CHARLES REIFSCNEIDER, M.D.

KENNETH LEGGE, M.D.

Hospital Council

ALFRED T. GUNDRY, M.D.

GEORGE SARGENT, M.D.

Nominating Committee★JOHN E. SAVAGE, M.D., *Chairman*

OLIVER S. LLOYD, M.D.

J. SHELDON EASTLAND, M.D.

WILLIAM SEABOLD, M.D.

FRANK GERAGHTY, M.D.

Library Committee

WILLIAM S. LOVE, JR., M.D.

*Trustee Students' Rotating Fund*FRANCIS J. KIRBY, M.D., *Chairman*

R. L. MITCHELL, M.D.

A. F. RIES, M.D.

EUGENE HAYWARD, M.D.

Editors

EMIL NOVAK, M.D.

C. GARDNER WARNER, M.D.

Alumni Council

★WILLIAM H. TRIPLETT, M.D.

THOMAS B. AYCOCK, M.D.

ENDOWMENT FUND

The following constitute the Board of Trustees of this Fund:

E. F. KELLY, *Chairman*

J. M. H. ROWLAND

ROBERTSON GRISWOLD

ARTHUR M. SHIPLEY

HENRY HOLZAPFEL, JR.

HARRY CLIFTON BYRD

ALBERT BURNS

H. BOYD WYLLIE

This Board is incorporated by act of the Legislature of the State, its legal title being "The Trustees of the Endowment Fund of the University of Maryland," and is independent and self-perpetuating. Its powers are limited to the expenditure of the interest derived from the various funds, which is applied as directed by donors for the benefit of the University. Contributions, donations and bequests are solicited from Alumni and friends. They may be made to the general or Uni-

versity Fund, to the Medical Fund or to any other department of the University. If intended for the School of Medicine, they may be given to the general medical fund or to some special object, as building, research, library, pathology, hospital, publication, laboratories, gymnasium, scholarship, medal, prize, etc., in which case the wishes of the donor will be strictly regarded. Attention is invited to the "Charles Frick Research Fund," already established in memory of that distinguished investigator. Checks should be made payable to The Trustees of the Endowment Fund of the University of Maryland, H. Boyd Wylie, Treasurer, Lombard and Greene Streets, Baltimore, Md.

FORMS OF DEVISE OR BEQUEST

TO SCHOOL OF MEDICINE

I give, devise and bequeath to the Regents of the University of Maryland, a corporation incorporated under the laws of the State of Maryland, for the benefit of the Faculty of Physic.....

(Here state amount or describe property)

TO ENDOWMENT FUND

I give, devise and bequeath to the Trustees of the Endowment Fund of the University of Maryland, a corporation incorporated under the laws of the State of Maryland, for the benefit of the Faculty of Physic.....

(Here state amount or describe property)

THE UNIVERSITY OF MARYLAND SCHOOL OF NURSING

The University of Maryland School for Nurses was established in the year 1889. Since that time it has been an integral part of the University of Maryland, coming under the same government. It is a non-sectarian school, the only religious services being morning prayers.

The University Hospital is a general hospital containing about 435 beds. It is equipped to give young women a thorough course of instruction and practice in all phases of nursing.

Programs Offered: The programs of study of the school are planned for two groups of students: (a) the five-year group, (b) the three-year group.

The requirements for admission to the five-year program of the School of Nursing are the same as for other colleges of the University. The completion of this course entitles the student to the degree of Bachelor of Science from the University of Maryland and to the diploma of the University Hospital School of Nursing.

The requirements for admission to the three year program are the satisfactory completion of an academic course in an approved high school. The completion of this course entitles the student to the diploma of the University of Maryland School of Nursing. Blank certificates will be furnished upon application to the Director of the School of Nursing.

MERCY HOSPITAL SCHOOL OF NURSING

The Mercy Hospital School of Nursing was established in 1899 and incorporated on December 23, 1901. It is an integral part of the Mercy Hospital and is under the same government. Mercy Hospital affords exceptional advantages for the education of nurses. It is a general hospital containing 330 beds, and offers opportunities for a thorough and varied experience. By its institutional affiliation with the University of Maryland it secures Professors who give to the student the results of their training and experience in the fields of the medical and affiliated sciences.

The University of Maryland, in affiliation with the Mercy Hospital School of Nursing, offers a five year combined Academic and Nursing program. The completion of this course entitles the student to the degree of Bachelor of Science from the University of Maryland, and to the diploma of the Mercy Hospital School of Nursing. Graduate nurses who hold college degrees are greatly in demand, especially for positions in administration and teaching institutions. This program consequently offers a distinct advantage.

INDEX TO PERSONAL NAMES

- Abbott, Thomas G., 33
 Abercrombie, John R., 12, 69
 Abeshouse, Benjamin, 13, 57
 Acton, Conrad B., 13, 58
 Acton, Elizabeth, 90
 Adam, Alberto Lotfalla, 88
 Adams, Rowland K., 7
 Adams, Thurston R., 14, 25, 35, 53, 66, 71, 73
 Aderholdt, Marcus Lafayette, Jr., 88
 Ahroon, William Alstrom, 32, 84, 85, 87
 Albright, J. Warren, 15, 25, 74
 Alvarez, José Alberto, 91
 Amberson, William R., 8, 9, 55
 Anchell, Melvin, 91
 Anderson, A. Russell, 13, 62
 Anderson, Franklin B., 10, 19, 37, 70, 72
 Anderson, Jane, 37
 Anderson, Phillis J., 93
 Ardinger, Joseph Atanley, Jr., 91
 Arnick, Eleanor, 34
 Arnold, James G., 14
 Arnold, James G., Jr., 20, 72
 Ashbury, Howard E., 37
 Ashbury, Howard H., 34
 Ashman, Harry, 33
 Ashman, Leon, 15, 59
 Atkins, John L., 16, 59
 Ayccock, Thomas B., 9, 18, 28, 34, 36, 65, 96

 Bachrach, David Nathan, Jr., 84, 85, 87
 Bacon, Arthur Maynard, Jr., 91
 Badt, Bernhard, 13, 23, 64
 Baetjer, Walter A., 10, 18, 58
 Baggott, Bartus T., 29
 Bagley, Charles, Jr., 9, 19, 36, 37, 65, 72
 Baldwin, Earl Rudolf, Jr., 84, 85, 87
 Baldwin, Ruth Workman, 90
 Balfour, Charles E., 15
 Ballard, Margaret B., 13, 26, 74
 Ballard, William Riley, Jr., 90
 Barker, Lewellys, F., 37
 Barkoff, Samuel, 23
 Barnes, George B., 31
 Barnett, Charles P., 31
 Barthel, Robert A., Jr., 22
 Barthel, Robert Amthor, Jr., 84, 85, 87
 Bassan, Morton Edward, 84, 85, 87
 Baxley, Joshua W., III, 21
 Bayley, George, 33
 Baylus, M., 25
 Beck, Harry McBrine, 31, 32, 33
 Beck, Harvey G., 9, 29, 57
 Beck, Nathaniel, 59
 Beck, Nathaniel M., 15, 33, 62
 Behr, Eleanor, 30
 Belemmer, J. J., 36
 Bell, Frederick K., 17, 56
 Bell, Houston Leshner, 91
 Bell, R. C., 37

 Bennett, Lillian Feykert, 90
 Bennett, Van B., 22
 Bennett, Van Boring, 84, 85, 87
 Bergland, J. McFarland, 10, 74
 Berke, Joseph B., 36
 Berman, Sidney, 17, 23, 62
 Berry, Herbert Lee, 90
 Berry, Robert Zinn, 88
 Bieren, Roland E., 20, 21, 76
 Bimestefer, L. W., 36
 Bird, Joseph G., 22
 Bird, Joseph Gordon, 84, 85, 87
 Bishop, Ruth M., 17, 56
 Bispham, W. N., 11, 58
 Bitsack, Joseph William, 90
 Bizzel, James Wooten, 88
 Black, William Pollack, Jr., 91
 Blake, Charles F., 9, 28, 29, 34, 71
 Blank, H. Robert, 23
 Bloxom, John Madison, III, 91
 Blum, Louis B., 24
 Blumberg, Joseph M., 15, 26, 59, 61, 74
 Boettiger, Edward G., 14, 55
 Bongardt, H. F., 11, 32, 66
 Bongardt, Henry F., 28
 Bordley, John, 36
 Bowe, Dudley P., 13, 26, 74
 Bowen, Charles Vernon, Jr., 88
 Bowen, Francis Dorsey Thomas, 84, 85, 87
 Bowie, Harry C., 16, 17, 53, 66
 Bowyer, Thomas S., 13, 26, 76
 Boyd, C. Holmes, 35
 Boyd, Kenneth B., 12, 26, 74, 76
 Bradley, J. E., 18
 Bradley, J. Edmund, 11, 36, 63
 Brady, Charles Eldon, 91
 Brady, Frank Joseph, 91
 Brady, Leo, 11, 19, 75
 Brager, Simon H., 12, 28, 32, 34, 66
 Bramble, Charles E., 30
 Brandes, Herbert Gibbs, 91
 Brandt, Frederick Bertram, 90
 Brantigan, Otto C., 12, 35, 53, 66
 Brennan, Thomas Joseph, 88
 Briele, Henry A., 20, 21
 Brill, Warren Daniel, 91
 Brinton, Sherman Simons, 88
 Briscoe, Ruth Lee, 39
 Brobst, Henry Thomas, 90
 Brodsky, Alexander Emmanuel, 84, 85, 87
 Brooks, Ralph King, 88
 Brooks, Ross Chilton, 88
 Brosius, Dorothy, 24
 Broughton, L. B., 8
 Brouillet, George H., 16, 25, 53, 66
 Brown, Ann Virginia, 14, 56
 Brown, Charles William, 90
 Brown, James Mack, 90
 Brown, Richard James, 91

- Brown, Thomas R., 37
 Bryant, Samuel H., 26
 Bryson, William James, 88
 Bubert, H. M., 11, 24, 58
 Buchness, A. V., 14, 66
 Buckey, Robert Bruce, 91
 Buettner, Henry F., 13, 55
 Burns, Albert, 96
 Burns, Harold H., 16, 30, 32, 67
 Burns, J. Howard, 29
 Byerly, M. Paul, 13, 22, 24, 63
 Byerly, William L., Jr., 22
 Byerly, William Luther, Jr., 84, 85, 87
 Byrd, Harry Clifton, 7, 8, 18, 96

 Cadden, John Joseph, 91
 Callahan, Daniel Harry, Jr., 91
 Cannon, Lawrence S., 20
 Caplan, Lester H., 21
 Carey, Richard A., 22
 Carey, Richard Alexius, 84, 85, 87
 Carey T. Nelson, 10, 18, 29, 58
 Carliner, Paul E., 15, 24, 59
 Carozza, Anthony F., 16, 22, 24, 59
 Carr, C. Jelleff, 10, 56
 Carr, Charles Edwin, Jr., 91
 Castagna, Joseph V., 13, 26
 Celeste, Sister M., 28
 Cephas, Sister M., 28
 Chambers, Earl L., 13, 29, 32, 58
 Chambers, Thomas R., 10, 28, 65
 Chance, L. T., 15, 66
 Chapman, Ross McC., 9, 18, 62
 Chaput, Charles Dupre, 91
 Cheney, William S., 16, 66
 Chenowith, Ralph Stallings, 88
 Chenowith, Robert, 25
 Chenowith, Robert F., 15, 66
 Chesnut, W. Calvin, 7
 Cintron, Miguel A., 91
 Clapp, Clyde A., 8, 9, 18, 19, 76
 Clarke, Carl Dame, 10, 78
 Cloninger, Rowell Connor, 91
 Clopter, Charlotte, 30
 Clough, Paul W., 10, 58
 Clyman, Martin, 20
 Coblentz, Richard G., 10, 19, 36, 65, 72
 Coberth, M. E., 36
 Coffman, Harry Franklin, 32
 Coffman, Harry Franklin, II, 84, 85, 87
 Cohen, Harry, 88
 Cole, John T., 20, 21, 75
 Cole, William P., Jr., 7
 Collenberg, H. T., 30
 Colon-Yordan, Ernesto, 90
 Compton, Beverley C., 12, 19, 26, 35, 72, 76
 Concilus, Frank, 84, 85, 87
 Cone, Elizabeth S., 93
 Constantini, John, 23
 Cook, Elmer Ellsworth, Jr., 90
 Coonan, Thomas J., 12, 30, 63
 Copeland, Herbert Bernard, Jr., 91
 Copeland, Murray M., 14, 27, 36, 66, 72

 Corbett, Sybil, 84, 85, 87
 Cordish, Ruth, 93
 Cornbrooks, Ernest I., Jr., 14, 26, 35, 73, 76
 Corpening, William, 90
 Correll, Paul H., 31
 Cotter, Edward F., 14, 57, 64
 Cotton, Albertus, 9, 29, 30, 32, 36, 69, 77
 Coughlan, Stuart G., 16, 20, 67
 Coughlin, John Benedict, 88
 Council, W. A. H., 12, 19, 25, 71
 Courtney, Donald Lawrence, 88
 Covington, E. Eugene, 12, 27, 28, 29, 32, 34, 66, 72
 Cowley, R. Adams, 91
 Cox, Matthew Mordica, 32, 84, 85, 87
 Crane, Warren Eugene, 84, 85, 87
 Crastnopol, Philip, 88
 Crawford, Robert C., 17, 59
 Crighton, Annie, 18
 Crosby, Robert MacGonigle Nelson, 90
 Crouch, J. Frank, 8
 Culver, Samuel H., 15, 66
 Cunningham, Raymond, 20, 21
 Currence, William Ward, 84, 85, 87
 Currie, Dwight, 66
 Currie, Dwight M., 15
 Curtiss, Robert Kimber, 90
 Cusani, Benedict Albert, 88

 Dalmáu, Miguel Sebastian, 88
 Dann, Alfred Henry, 90
 Dann, Daniel I., 16, 26, 74
 Daue, Edwin O., 21
 Daue, Edwin O., Jr., 17, 59
 Davidson, Charles H., 13
 Davidson, Charles N., 19, 20, 77
 Davidson, Charles W., 25
 Davidson, Nachman, 16, 24, 59
 Davies, Ross, 11, 64
 Davies, Thomas Eugene, 84, 85, 87
 Davila-Lopez, José G., 84, 85, 87
 Davis, Carl L., 8, 54
 Davis, E. Hollister, 15, 19, 68
 Davis, George, 21
 Davis, George H., 16, 74
 Davis, John Russell, Jr., 32, 84, 85, 87
 Davis, John Staige, 37
 Davis, S. Griffith, 9, 19, 68
 Davies, Thomas Eugene, 32
 Davis, William Joseph Graham, 88
 Davisson, Claude Richmond, 32
 Day, Edward Colson, 90
 Day, Newland Edward, 84, 85, 87
 Debuskey, B. Matthew, 13, 35, 63
 de Chantal, Sister M., 28
 Deckert, W. Allen, 14, 26, 74, 76
 Deckert, W. Allen, Jr., 66
 Demarco, S., 13, 66
 Demarco, S., Jr., 28, 32
 DeVincents, Michael L., 31
 Dickey, Francis G., 14, 23, 58, 62
 Diehl, William K., 17, 20, 26, 27, 35, 73, 76
 Diggs, Everett S., 17, 26, 73, 76
 Dillinger, Karl Anton, 84, 85, 87

Dillon, Harold, 90
 Diorio, John Daniel, 88
 Dixon, D. McClellan, 16, 26, 74
 Dixon, Philip Lafayette, Jr., 84, 85, 87
 Dodd, Patricia, 91
 Dodd, William A., 31, 33
 Doeller, Charles H., Jr., 75
 Donahue, Bernard W., 16, 74
 Dorman, Hamilton Peacock, 90
 Dorman, William, 35
 Dorsey, Brice M., 9, 26, 73
 Douglass, L. H., 19, 22, 74
 Douglass, Louis H., 8, 9, 18, 35
 Doukas, James A., 91
 Downey, J. W., 9, 28
 Downey, J. W., Jr., 19
 Doyle, John Justin, 90
 Drake, Miles Edward, 91
 Duckwall, Fred, 25
 Duffy, William C., 31, 32
 DuMez, Andrew G., 8
 Dumber, John C., 12, 26, 35, 72, 76
 Dunne, Thomas Benjamin, 88
 Dunnigan, Wm. C., 28

Eastland, J. S., 11, 58
 Eastland, J. Shelon, 29, 33, 96
 Eaton, William Robert, 88
 Ebeling, William Carl, III, 92
 Edlow, Ernest S., 13, 30, 33, 76
 Edmunds, Page, 9, 18, 65, 73
 Edwards, C. Reid, 36
 Edwards, Charles Reid, 9, 18, 65
 Edwards, Monte, 9, 19, 25, 36, 65, 71
 Ehrlich, Daniel, 90
 Elgin, William W., 23
 Elias, Thomas Glenn, 92
 Elliott, Ruth, 19, 68
 Ellis, Francis, 11, 69
 Ellis, Francis A., 33
 Epperson, John Wallace Walker, 88
 Erwin, J. J., 15, 76
 Erwin, John J., 30, 33
 Evans, William Ellsworth, 11
 Evans, William Ellsworth, Jr., 56
 Everett, Guy M., 17, 55
 Everett, Houston, 13, 76
 Everett, John Thomas, 92
 Ewing, Jane, 37

Falls, Mrs. Phyllis B., 37
 Fargo, L. K., 12, 32, 71
 Fargo, Leon K., 29
 Farkas, Robert William, 92
 Fearing, William L., 13, 23, 64
 Feaster, James Henry, Jr., 92
 Feldman, Maurice, 10, 30, 33, 62
 Feldman, Maurice, Jr., 92
 Ferri, Henry Guy, 90
 Figge, Frank H. J., 10, 53
 File, Richard Cushing, 84, 85, 87
 Fine, M. A., 22
 Fine, Morris, 15, 58

Finegold, Aaron Nathan, 90
 Fineman, Jerome, 13, 24, 30, 33, 63
 Finkelstein, A. H., 11, 24, 63
 Finney, J. M. T., 36
 Fisher, William H., 20, 21
 Fleck, H. K., 9, 28, 76
 Flippin, Eugene L., 12, 25
 Flynn, Philip D., 13, 58
 Foard, Wilbur Harper, 92
 Foley, J. J., 29
 Ford, Frank R., 36
 Forman, Sylvan E., 17, 56
 Fort, Wetherbee, 12, 29, 58
 Foster, Herbert M., 15, 66
 Fowler, Richard Lowman, 88
 France, Germanus John, 92
 Franz, John H., 22
 Franz, John Howard, 84, 85, 87
 Freedom, Leon, 10, 18, 23, 57, 64
 Freeman, E. B., 11, 58
 Freeman, Irving, 14, 22, 24, 33, 58
 French, Samuel Lawson, 88
 Frey, Edward L., Jr., 16, 32
 Fridl, Joseph Warren, 92
 Friedenwald, Edgar B., 9, 30, 63, 96
 Friedenwald, Harry, 8, 28, 37
 Friedenwald, Jonas, 11, 76
 Friedenwald, Julius, 8, 30, 33
 Friedman, Marion, 84, 85, 87
 Friedman, Paul Norman, 88
 Frye, Augustus Homer, Jr., 90
 Fuertes, José Rodriquez, 84, 85, 87
 Furlong, Rose, 68
 Furlong, Rose L., 19
 Furnari, Joseph Charles, 84, 85, 87
 Fusco, J. D., 29, 34
 Futterman, Perry, 92

Galitz, Eli, 90
 Galvin, Thomas K., 11, 28, 30, 33, 75
 Gamble, C. B., 29
 Garcia y Garcia, José Antonio, 92
 Gardner, Maud M., 37
 Gardner, William S., 8, 30
 Gareis, L. Calvin, 75
 Garis, Robert W., 13, 23, 58
 Garlick, William M., 16, 32, 67
 Garrett, Richard Mitchell, 90
 Garrison, Alfred Selman, 89
 Gaskel, J. H., 29
 Gaskell, Jason H., 16, 32, 69
 Gassaway, Franklin Drenna, 92
 Gellman, Moses, 10, 19, 25, 36, 69
 Geraghty, Frank, 96
 Geraghty, Frank J., 12, 58
 Geraghty, William R., 14, 66
 Gertman, Samuel, 22
 Gibbs, R. L., Jr., 21
 Gibbs, Robert L., 17, 59
 Gichner, Joseph E., 9, 18, 57
 Giglia, Tony Robert, Jr., 89
 Gillespie, John L., 31
 Gillis, A. J., 9

- Gillis, Andrew C., 9, 30, 33, 64
 Gillis, Francis W., 12, 29, 32, 71
 Gillis, Marion H., 17, 76
 Ginsberg, Leon, 37
 Glick, Samuel S., 12, 24, 63
 Glover, Albert Jerome, 92
 Godlove, John Carlton, 92
 Goldberg, Raymond Bernard, 89
 Goldman, A., 23
 Goldsborough, Charles R., 11, 22, 58
 Goldsmith, Harry, 11, 23, 30, 33, 62
 Goldsmith, Jewett, 84, 85, 87
 Goldstein, Albert E., 12, 56
 Goldstein, Harold, 26
 Goldstein, Marvin, 92
 Goldstone, Herbert, 22
 Golley, K. W., 29
 Goodman, Harold M., 12, 25
 Goodman, Julius, 28
 Goodwin, T. Campbell, 10, 35, 63
 Gore, Robert J., 16, 24, 63
 Govatos, George, 15, 66
 Goynes, Richard, 21
 Goynes, Richard L., 20, 75
 Graff, H. F., 27
 Graff, Henry F., 11, 19, 76
 Graham, Robert L., 14
 Graham, Walter R., 21
 Gramse, Arthur Edward, 84, 85, 87
 Granoff, H. L., 15, 33, 76
 Granoff, Harry L., 30
 Grave de Peralta, José Ignacio, 89
 Gray, David Benoni, 89
 Graziano, Theodore Joseph, 32
 Greenfield, William, 15, 23, 62
 Gregory, Exie Mildred, 84, 85, 87
 Greiner, D. James, 11, 56
 Grenzer, William H., 15, 29, 32, 35, 58
 Griswold, Robertson, 96
 Gross, Joseph B., 16, 59
 Grove, Donald B., 16, 66
 Grubb, Wilson, 14, 63
 Grumbine, Francis Levine, 92
 Gubnitsky, Albert, 90
 Gundry, Alfred T., 18, 96
 Gundry, Lewis P., 11, 22, 23, 58
 Guthrie, William Wilkinson, 92
 Guyther, Joseph Roy, 90
 Haase, John H., 20
 Hachtel, Frank W., 8, 55
 Hagan, William Baker, 89
 Hahn, William E., 10, 73
 Hamburger, Morton Leonard, 84, 85, 87
 Hamill, James Edward, 92
 Hankin, Samuel J., 16, 22, 24, 59
 Hannan, Alice R., 34
 Hanrahan, E. M., 13, 66
 Hanrahan, Edward M., Jr., 35
 Hard, Walter L., 11, 54
 Harman, Roy Samuel, 92
 Harne, O. G., 10, 54
 Harne, William G., 56
 Harris, William Myrick, 90
 Hartz, Alvin S., 20
 Hassler, Frank Stanley, III, 89
 Haught, John Stevenson, 90
 Haws, John M., 35
 Hayden, Richard Carroll, 92
 Hayward, Eugene, 96
 Healy, Robert F., 15, 66
 Hedrick, Thomas A., 16, 31, 32
 Heghinian, Jeannett R., 15, 25, 69
 Helfrich, Raymond F., 12, 28, 32, 66
 Helfrich, William G., 14, 23, 58
 Helms, Samuel T., 13, 58, 61, 71
 Henneberger, Lowell P., 35
 Herold, Paul Garmer, 92
 Herrmann, Albert Casper, 92
 Hersperger, W. G., 24
 Hersperger, W. Grafton, 13, 58
 Hewitt, J. Frank, 13, 25, 66
 Hibbits, John T., 12, 26, 35, 76
 Highstein, Benjamin, 16, 25, 69
 Hintz, Carl W. E., 39
 Hobelmann, Charles Frederick, 92
 Hogan, John F., 12, 25, 71
 Hohman, Leslie B., 11, 62
 Holden, F. A., 13, 76
 Holden, Frank A., 27
 Hollander, David, 14, 57
 Hollander, Mark, 16, 25, 69
 Holljes, Henry Wirt Duvall, 92
 Holzapfel, Henry, Jr., 7, 96
 Honigman, Alvin Herbert, 89
 Hooper, Z. V., 23
 Hooper, Z. Vance, 12, 62
 Hopkins, John V., 15, 25, 69
 Horine, Cyrus F., 10, 66
 Horn, Helen Amelia, 92
 House, Jane, 30
 Houska, Henry John, 92
 Howell, Clewell, 12, 24, 63
 Howell, Roger, 8
 Hubbard, Prevost, Jr., 84, 85, 87
 Hudson, Rollin C., 15, 25, 69
 Hull, Harry C., 12, 35, 53, 66
 Hulla, Jaroslav, 14, 26, 74
 Humphries, William C., 16, 70
 Hundley, J. Mason, Jr., 8, 9, 18, 19, 22, 25, 26, 35, 72, 75
 Hunt, William Jack, 89
 Hunter, James S., Jr., 21
 Hussey, Raymond, 10, 18, 35, 58
 Hutchins, Elliott H., 9, 28, 65
 Hyman, Calvin, 14
 Hyman, Calvin B., 66
 Iguina-Jimenez, Manuel Antonio, 90
 Ingenito, Gabriel Andrew, 90
 Ingram, Albert Lester, Jr., 84, 85, 87
 Ingram, Charles Hal, 90
 Ingram, Phyllis Ray, 92
 Inloes, Benjamin H., Jr., 21
 Inman, B. Wallace, 14, 29, 34, 73
 Inman, Conrad L., 14

- Irwin, Robert Clark, 84, 85, 87
 Isales, Luis Manuel, 90

 Jacobs, Joye E., 15, 55
 Jacobson, Meyer W., 13, 22, 23, 58
 Jaffe, Albert, 11, 18, 24, 63
 James, Oliver A., 17, 67
 Jaworski, Melvin Joseph, 90
 Jenkins, William Romulus, 89
 Jennings, F. L., 9, 28, 65
 Jensen, Jacob R., 15, 26, 74
 Jeppi, Joseph V., 29, 33
 Jeradi, Joseph V., 15, 28, 32, 66
 Jernigan, John Mayo, Jr., 92
 Jewett, Hugh, 15, 36, 71
 Johnson, Edward S., 10, 65
 Johnson, Hansford Fred., 84, 86, 87
 Johnson, Marius P., 14, 26, 35, 56, 74
 Johnson, S. Lloyd, 22
 Johnson, W. R., 25
 Johnson, William R., 13, 66
 Jones, Bobby Lee, 92
 Jones, Edward G., 20, 21
 Jones, Everett Davis, 84, 86, 87, 89
 Jones, Harry G., 22
 Joseph, Sister M., 28
 Joslin, C. Loring, 9, 18, 22, 24, 63

 Kadan, Ferd. E., 15, 26, 74
 Kahn, M. Randolph, 9, 76
 Kallins, Edward S., 13, 24, 58
 Kaltreider, D. Frank, 16, 26, 75
 Kammer, William H., Jr., 31
 Karns, Clyde F., 66
 Kardash, Theodore, 22, 84, 86, 87, 89
 Karfgin, Arthur, 16, 59
 Karfgin, Walter E., 23
 Karns, Clyde F., 15
 Karns, James R., 17, 21, 59
 Katzenstein, Lawrence, 15, 59
 Kaufman, Vernon D., 10, 73
 Kayser, F. A., 16, 29, 70
 Keadle, Robert Franklin, 89
 Keeley, Joseph Francis, Jr., 84, 86, 87, 89
 Keeney, Dan Franklin, 90
 Kelly, E. F., 96
 Kemler, Joseph I., 12, 29, 76
 Kemp, Norval, 21
 Kemper, Charles Alexander, 90
 Keown, Lauriston L., 15, 24, 63
 Kevin, Sister M., 30
 Kiefer, Robert Allan, 32, 84, 86, 87
 Kilby, Walter L., 8, 9, 19, 25, 77
 Kindell, Frank B., 12, 35, 57
 King, John T., Jr., 34
 Kinnamon, Howard F., Jr., 31
 Kinney, Earl Ray, 90
 Kirby, Francis J., 96
 Kishpaugh, Marjorie Bird, 92
 Kitlowski, Edward A., 12, 35, 36, 66, 74
 Kleiman, Allen, 90
 Klemkowski, Irvin P., 26
 Klijanowicz, Stanley Benedict, 84, 86, 87

 Klimes, Louis F., 33
 Knapp, Hubert C., 29
 Knerler, Charles W., 17, 59
 Knowles, F. Edwin, Jr., 13, 33, 76
 Kohn, Schuyler, 21, 75
 Koleshko, Lawrence Jacob, 84, 86, 87
 Kolman, Lester N., 14, 25, 69
 Koon, Charles Herbert, 92
 Koppelman, M. S., 13, 23, 62
 Krah, Vernon E., 16, 53
 Krantz, John C., Jr., 8, 9, 56
 Krause, Louis A. M., 10, 18, 29, 35, 58, 77
 Kreis, George Joseph, Jr., 92
 Kremen, A., 14, 76
 Krepp, Martin William, Jr., 84, 86, 87
 Kroll, John Gregory, 84, 86, 87
 Kroll, Louis J., 15, 59
 Kundahl, Paul Charles, 84, 86, 87
 Kyper, Frederick T., 21

 La Mar, Robert Charles, Jr., 89
 Lambert, Harman James, Jr., 92
 Lampley, William Askew, 92
 Lang, Milton C., 14, 27, 76
 Langeluttig, H. Vernon, 58
 Langeluttig, Henry V., 12
 Langworthy, O. R., 36
 Latimer, Clarence Vinette, Jr., 90
 Lavenstein, Arnold F., 16, 20, 21, 24, 63
 Lawson, Marion Edward, 92
 Layman, J. Walter, 96
 Leach, C. Edward, 14, 23, 58
 Lee, F. C., 35
 Lee, Ferdinand Wayne, 89
 Legge, John E., 11, 18, 22, 29, 58
 Legge, Kenneth, 96
 Legge, Kenneth D., 9, 29, 32, 70
 Legum, Samuel, 13, 22, 58
 Leitch, William H., 21
 Leitz, T. Frederick, 30
 Lerman, Philip H., 92
 Lerner, Philip F., 13, 30, 33, 64
 Levi, Ernest, 13, 23, 62
 Levin, H. Edmund, 13, 55, 58
 Levin, Manuel, 23
 Levine, Stuart Charles, 92
 Levinson, Lorman L., 21
 Levy, Kurt, 14, 22, 58
 Lewis, Richard Quarles, 89
 Lilienfeld, S., 24
 Link, Etta C., 22
 Link, Etta Carolyn, 84, 85, 86, 87
 Linn, Robert, 20
 Lipin, Raymond J., 32
 Lisansky, Ephraim T., 16, 24, 57, 59
 Little, Luther E., 13, 25, 35, 66
 Littlefield, James Beaton, 92
 Livingood, William C., 31
 Livingstone, Robert Charles, 89
 Lloyd, Oliver S., 96
 Locher, R. W., 10, 28, 65
 Lockard, G. Carroll, 9, 18, 57, 73
 Loewald, Hans, 23

- Lohan, Junie Brooks, 92
 Loker, F. Ford, 31
 Long, Edgar F., 8
 Long, William B., Jr., 16, 69
 Longwell, Robert Hamilton, 84, 86, 87
 Looper, Edward A., 9, 19, 37, 70
 Lord, Harrison Luther, 92
 Love, Wm. S., Jr., 10, 18, 23, 57, 58, 96
 Lowe, William C., 16, 31, 32
 Lowitz, Irving Robert, 84, 86, 87
 Lowndes, Rear Admiral Charles H. T., 96
 Lukats, Paul George, 89
 Lurting, Frederick Wilbur, 90
 Lutz, John F., 11, 54

 Maccubbin, H. Pearce, 16, 21
 MacDonald, Charles Renwick, 89
 Macgowan, Birkhead, 29
 Machen, John W., 16, 33, 64
 Mack, Ernest W., 17, 67
 Maconachy, William Victor, Jr., 92
 Maginnis, Helen I., 16, 26, 76
 Maldeis, H. J., 58
 Maldeis, Howard J., 10, 56, 65
 Mamula, Peter, 90
 Manganiello, Louis O., 22
 Manganiello, Louis Otto, 84, 86, 87
 Manieri, Frank V., 24
 Mansforfer, G. Bowers, 12, 30, 33, 63
 Mansfield, W. Kenneth, Jr., 16, 26, 74
 Marek, Charles B., 26
 Marino, Frank Sebastian, 84, 86, 87
 Markowitz, Arnold Robert, 90
 Marshall, Joseph, 23
 Marvel, N. Clyde, 10, 28, 65
 Maseritz, I. H., 14, 29, 32, 69
 Matchar, Joseph Charles, 89
 Maxson, Charles W., 28
 Maxwell, George Alexander, Jr., 92
 Mays, Howard B., 14, 19, 25, 36, 57, 71
 Mazer, Maxwell L., 15, 26, 74
 Mazer, Robert, 84, 86, 87
 McAlpine, James G., 10, 55
 McCall, George W., 20
 McCarthy, Harry B., 37
 McCormack, Lloyd Leo, 90
 McCort, James J., 20, 21
 McCosh, James Nathaniel, Jr., 84, 86, 87
 McDaniel, Edward P., Jr., 21
 McElwain, Howard B., 14, 28, 66
 McFadden, Robert Burns, 90
 McFaul, William N., Jr., 28
 McGoogan, Malcolm Thomas, Jr., 84, 86, 87
 McGrath, William Edward, Jr., 90
 McKenzie, W. Raymond, 12, 29, 70
 McKinney, William W., 17, 72
 McLanahan, Samuel, Jr., 15, 35, 66
 McLean, George, 10, 29, 58, 96
 McMillan, Marcy Emory, Jr., 89
 McMillan, Parker, Jr., 34
 McMullin, Joseph Frederick, 90
 McNally, Hugh B., 14, 26, 35, 74
 Meade, DeVoe Kepler, 90

 Meade, Forest C., 20, 21
 Mearns, Robert B., 17, 21, 59
 Mech, Karl F., 15, 57
 Medairy, George C., 33, 64
 Mele, Vincent James, Jr., 89
 Meli, John James, 84, 86, 87
 Méndez, Néstor Hernan, 89
 Meranski, Israel P., 15, 24, 63
 Merkel, Walter C., 11, 30, 56
 Meyerowitz, Joseph R., 24
 Miksinski, B. W., 36
 Millan, L. J., 12, 25, 70
 Millan, Lyle J., 19
 Miller, Edgar Allen, Jr., 84, 86, 87
 Miller, J. M., 29
 Miller, James Delmar, 89
 Miller, Sydney R., 10, 58
 Miller, William S., 20
 Milloff, Bernard, 92
 Minervini, Robert Virginus, 89
 Mintz, Donald Willis, 92
 Miranda, Angel Neftali, 90
 Mitchell, George W., 29
 Mitchell, R. B., Jr., 13, 58
 Mitchell, R. L., 96
 Mitchell, Robert B., Jr., 23
 Moores, J. Duer, 14, 27, 66, 72
 Morgan, Jack Calvin, 90
 Morgan, Zachariah, 11, 18, 22, 62
 Morris, Frank K., 13, 30, 33, 74, 76
 Morris, John Davis, 89
 Morrison, Samuel, 11, 23, 62
 Morrison, Theodore H., 9, 30, 62
 Mosberg, William Henry, Jr., 92
 Moses, Robert Abram, 84, 86, 87
 Moses, William R. W., 37
 Muller, S. Edwin, 15, 24, 59, 67
 Mullins, George Roy, Jr., 84, 86, 87
 Murdock, Harry M., 11, 18, 62
 Murphy, Willa, 30
 Muse, Joseph E., Jr., 16, 23, 59
 Musnick, Henry, 89
 Musser, Ruth, 13, 56
 Myers, John A., 14, 58, 61, 62
 Myers, Joseph Carl, 89
 Myers, Myron Joseph, 91

 Nash, Kenneth Powell, 89
 Neff, Charles Amos, 89
 Neller, Walter Irving, Jr., 92
 Nelson, Alfred Turner, 91
 Nelson, J. W., 27, 28, 32
 Nelson, James W., 12, 33, 66
 Newell, H. W., 11, 23, 62
 Norment, Richard Baxter, III, 92
 Norris, J. Edward, 15, 26, 74
 Novak, Emil, 10, 74, 96
 Novey, M. A., 19
 Novey, M. Alexander, 11, 74
 Nurkin, Joseph, 25

 O'Brien, Mary J., 19, 68
 O'Connor, John A., 28

- O'Donnell, Charles Francis, 92
 Ogden, Frank N., 12, 56
 O'Neill, Margaret, 34
 Orem, F. Stratner, 12, 24, 63
 Orofino, Caesar Francis, 84, 86, 88
 O'Rourke, Thomas R., 9, 19, 25, 27, 36, 70, 72, 76
 Ortega, Luis, 36
 Osborne, John Carlton, 32, 84, 86, 88
 Osborne, William Wilson, 92
 Oster, Robert H., 11, 55
 Owens, Richard S., 16, 24, 72
 Owens, Richard S., Jr., 20
 Owings, James C., 13, 25, 35, 71
 Ozazewski, John Casimir, 91
- Pacienza, F. A., 29, 33
 Palese, John Michael, 91
 Palmer, Margaret V., 21, 22
 Parés, Maria Amalia, 89
 Parr, William A., 15
 Parr, William D., 72
 Parrott, Frank Strong, 89
 Parsons, John W., 35
 Patterson, Carl Norris, 92
 Patterson, J. Milton, 7
 Peake, C. W., 12, 66
 Pearson, Grace, 27
 Pels, Isaac R., 36
 Perez, Enrique, 89
 Perry, Henry Baker, Jr., 89
 Pessagno, D. J., 9, 28, 65
 Peters, H. Raymond, 9, 28, 29, 30, 32, 57, 61
 Peters, Robert Joseph, 91
 Peterson, Preston Horsley, 89
 Pfeil, Edgar Thornton, 91
 Phelan, Patrick Carey, 32
 Phelan, Patrick Carey, Jr., 84, 85, 86, 88
 Phelps, Winthrop M., 36
 Phillips, Otto Charles, 84, 85, 86, 88
 Pierce, Leslie Harrell, 16, 20, 21
 Pierpont, Edwin Lowell, 92
 Pinas, Samuel Ronald, 90
 Pincoffs, Maurice C., 8, 18, 28, 29, 32, 57
 Pinschmidt, Norman, 17, 56
 Plagge, James C., 11, 53
 Polek, Melvin F., 31
 Pomeroy, William Henry, II, 91
 Pool, Champe Clark, 92
 Posey, Dale Morton, 84, 86, 88
 Poth, Edgar J., 35
 Pratt, Louis John, 92
 Preinkert, Alma H., 8
 Price, Philip B., 35
 Proctor, Donald F., 36
 Proctor, Samuel E., 15, 25, 66
 Pue, Mrs. R. B., 18
 Pushkin, Benjamin, 11, 23, 64
- Queen, Joseph Emmett, 89
- Raby, William T., 22
 Raby, William Thomas, 84, 86, 88
 Raffucci-Arce, Francisco Luis, 91
- Ramundo, Michael Raymond, 92
 Randolf, Edward Burl, 92
 Range, James Jacob, 91
 Rangle, Raymond Veto, 89
 Raskin, M., 28, 33
 Ratliff, Cliff, Jr., 91
 Ream, Norman B., 91
 Reavis, Charles W., 17, 77
 Recht, John Munn, 91
 Reeder, J. Dawson, 9, 19, 71
 Rees, Davis Thomas, 92
 Reese, J. G. M., 11, 19, 74
 Reese, J. Morris, 35
 Reifschneider, Charles, 96
 Reifschneider, Charles A., 10, 35, 65, 73
 Reifschneider, Herbert E., 14, 53, 66, 73
 Reimann, Dexter L., 17, 57, 61
 Reiter, Robert A., 13, 58
 Rennie, Thomas A. C., 35
 Renshaw, Josephine Elizabeth, 89
 Revell, Samuel T. R., 15
 Revell, Samuel T. R., Jr., 20, 59
 Revell, Walter J., 21
 Rhode, C. Martin, 21
 Rich, Benjamin S., 12, 24, 25, 29, 33, 36, 70, 72, 96
 Richards, Esther L., 35
 Richards, Granville Hampton, 89
 Ridgley, I. O., 12, 28, 32, 66
 Riely, Compton, 9, 19, 69
 Reinhoff, William F., 28
 Ries, A. F., 96
 Rigdon, Henry L., 17, 67
 Riley, Eugene John, 92
 Rinehart, Arthur Middleton, 91
 Ritchings, Edward Peyton, 32, 84, 86, 88
 Robbins, Martin Albert, 89
 Robbins, Morris Allen, 92
 Roberge, Agnes M., 93
 Roberts, Eldred, 16, 66
 Robertson, Merritt Ezekiel, 91
 Robinson, Daniel R., 15, 28, 32, 66
 Robinson, Harry M., Jr., 12, 24, 25, 59, 69
 Robinson, Harry M., Sr., 9, 19, 25, 37, 69
 Robinson, J. Ben, 8
 Robinson, Raymond V., 31
 Rockwell, Alice J., 23
 Rodler, Edith, 20
 Roetling, Carl P., 23
 Rogers, George Carraway, 91
 Rogers, H. L., 29
 Rogers, Harry, 36
 Rogers, Harry L., 10, 30, 32, 69
 Rogers, William Brannon, Jr., 91
 Rolfes, Harry Franklin, 92
 Roop, Donald J., 16, 31, 32, 63
 Rosen, Israel, 15, 24, 63
 Rosenstein, Louis Nathan, 89
 Rosin, John D., 22
 Rosin, John David, 84, 86, 88
 Rousos, Anthony Peter, 84, 85, 86, 88
 Rowland, J. M. H., 8, 96
 Royer, Earl Linwood, 89
 Rubenstone, Albert Irving, 92

- Rude, Richard Sprogoe, 89
 Runkle, John G., 15, 27
 Ruppertsberger, Marjorie, 17, 56
 Ruzicka, F. Frederick, 24
- Sacks, Milton S., 11, 57, 58, 61
 Sacks, Seymour, 89
 Sadler, Henry Harrison, Jr., 84, 86, 88
 Sadowsky, Wallace Hyman, 84, 86, 88
 Samuels, Abram S., 9, 30, 33, 75
 Samuels, Irving Leonard, 89
 Santiago, Stevenson Parker, 91
 Sapareto, Rocco Louis, 91
 Sargent, George, 96
 Sargent, George F., 18
 Sasscer, Robert B., 31, 32
 Savage, John E., 8, 12, 18, 19, 22, 26, 35, 74, 96
 Sborofsky, Isadore, 84, 86, 88
 Scarborough, Clarence P., 16, 25, 67
 Scavone, Edmund, 92
 Schaefer, John F., 31
 Scherlis, Irving, 91
 Schmidt, Charles, 14, 62
 Schmidt, Emil G., 10, 56
 Schmitz, W. J., 15, 63
 Schmitz, William J., 30
 Scholl, Mary Louise Lyons, 84, 86, 88
 Schwartz, Aaron David, 93
 Schwartz, Theodore A., 16, 29, 33, 70
 Scott, Earle S., 16, 20, 24, 63
 Scott, Joseph Whiddon, 84, 85, 86, 88
 Seabold, William, 96
 Seabold, William M., 12, 24, 30, 35, 63
 Seabright, Howard Lee, 93
 Seegar, J. King B. E., 17, 75
 Seigman, Edwin L., 21, 22
 Seliger, R. V., 37
 Semmes, John E., 7
 Senter, William Jeffress, 84, 86, 88
 Serra, Lawrence M., 14, 35, 58
 Settle, G. M., 10, 64
 Settle, George M., 18
 Settle, William B., 14, 16, 25, 26, 35, 67, 76
 Sevick, Charles V., 23
 Severn, Henry D., 31
 Shackelford, Richard T., 12, 28, 32, 66
 Sharp, Nathaniel, 89
 Shaw, Charles Edward, Jr., 93
 Sheehan, Joseph C., 31, 32
 Shelley, Harry S., 12, 19, 25, 71
 Sheppard, Robert C., 20, 21
 Sherrill, Elizabeth B., 22
 Shiling, M. S., 13, 58
 Shipley, A. M., 18
 Shipley, Arthur M., 8, 34, 36, 65, 96
 Shipley, Edgar R., 22
 Shipley, Edgar Roderick, 84, 86, 88
 Shipley, Frank Mollman, 91
 Shockhat, Albert J., 13, 23, 62
 Shortle, James Samuel, 91
 Shub, Maurice Isaac, 84, 86, 88
 Shumacker, Harris B., 35
 Shuman, Louis Harry, 84, 86, 88
- Siegel, Isadore A., 11, 19, 74
 Siemon, Mrs. Laura, 37
 Sigler, John Wiltshire, 89
 Silverton, George, 15, 58
 Simons, George Murray, 93
 Sindler, Joseph, 12, 30, 62
 Siwinski, Arthur G., 14, 27, 66, 73
 Skitarelic, Benedict, 17, 57
 Smith, Dietrich Conrad, 10, 55
 Smith, Edward P., 11, 28, 30, 33, 76, 96
 Smith, Edward Whittingham, Jr., 93
 Smith, Frederick B., 11, 30, 63
 Smith, Sol, 12, 29, 32, 58, 61
 Smith, William B., 30
 Smith, William H., 10, 18, 58, 96
 Smoak, Philip L., 20
 Snyder, Jerome, 15, 27, 76
 Snyder, Samuel, 15, 24, 59
 Soler-Favale, Marta Emilia, 89
 Solomon, Milton L., 17, 53
 Sones, Frank Mason, Jr., 91
 Spear, Irving J., 9, 18, 37, 64
 Spelsberg, Walter Karl, 93
 Spencer, Hugh R., 8, 18, 30, 37, 56
 Spencer, Tracy N., Jr., 31
 Spier, Andrew Allan, 89
 Sprunt, Thomas P., 8, 9, 18, 29, 57
 Stafford, Harold Relinger, 89
 Steele, Glenn, 22
 Stegmaier, James George, 32, 84, 86, 88
 Stein, Milton, 33
 Steinberg, Stanley Herbert, 93
 Steiner, Frederick W., 96
 Steinmueller, Karl J., 13, 66
 Sterling, Harold, 91
 Stevens, John S., 31
 Stewart, Edwin Harvey, Jr., 89
 Stichel, Frederick Louis, Jr., 93
 Stier, Howard William, 89
 Stifler, William B., 35
 Stiles, Cleo D., 13, 25, 70, 72
 Stoner, James Ernest, Jr., 89
 Stowell, Averill, 21
 Strauss, George A., Jr., 11, 33, 76
 Strauss, George S., Jr., 30
 Strayer, Webster M., 21
 Strobel, Martin Edward, 91
 Summa, Andrew Anthony James, 84, 86, 88
 Summerlin, Glenn Olson, 91
- Tanebaum, Solomon, 16, 25, 69
 Tappan, Benjamin, 37
 Tarun, William, 19, 37
 Taylor, Irving Julian, 89
 Tietelbaum, Harry A., 14, 23, 36, 53
 Teitelbaum, Harry B., 64
 Tenner, David, 13, 58
 Thomasina, Sister M., 28
 Thompson, Alexander F., 21
 Thompson, Lewis Bradford, 93
 Thompson, Raymond K., 21, 22
 Thompson, Talmadge Stanley, 91
 Tillman, Richard N., 16, 24, 59

- Tilt, Leroy Wortendyke, Jr., 91
 Linker, Francis Paul, 93
 Tipton, Dorsey R., 14, 73
 Tirrell, Genevieve, 30
 Toman, James E. P., 55
 Tonolla, E. H., 12, 23, 58
 Torres, José Manuel, 89
 Touhey, T. J., 14, 28, 66
 Toulson, W. H., 9, 19, 25, 70
 Toulson, W. Houston, 36
 Townsend, Francis James, 84, 86, 88
 Townshend, Wilfred H., Jr., 16, 21
 Traband, John H., 10, 24, 63
 Traband, Millard Tolson, Jr., 93
 Trader, Charles Weldon, 89
 Travers, Margaret, 34
 Traynor, Francis Willoughby, 84, 86, 88
 Trimble, I. Ridgeway, 12, 28, 32, 35, 66
 Triplet, W. H., 15, 58
 Triplett, William H., 96
 Trout, Hugh H., Jr., 17, 67
 Truitt, Ralph P., 10, 18, 22, 23, 62
 Tull, Myron G., 13, 64
 Tumminello, S. A., 29
 Tunney, Robert Boone, 89
 Turner, Philip C., 7
 Turner, Roy Byron, Jr., 93
 Tweed, Rumbough Chappel, 93

 Ubides, Pedro Federico, 91
 Uhlenhuth, Eduard, 8, 9, 53
 Ullrich, Henry F., 11, 19, 25, 36, 66, 69
 Ullsperger, John Francis, 93
 Ulrich, George J., 21

 Valliant, Nancy, 27
 Van Lill, Stephen Joseph, III, 89
 Vargas, Dharma Luz, 91
 Varhol, Joseph Gregory, Jr., 89
 Veronica, Sister M., 28
 Vollmer, Frederick J., 17, 59
 Voshell, Allen Fiske, 9, 19, 25, 35, 36, 69

 Wachsman, Irvin Louis, 89
 Wagner, John A., 14, 17, 57, 61
 Wagner, Philip S., 14, 62
 Waknitz, Frederick W., 16, 67
 Waldrop, Grayson Spencer, 91
 Walker, James H., 21
 Walker, Samuel Haywood, 89
 Walkup, Harry Ernest, 91
 Wallace, Joseph, Jr., 84, 86, 88
 Waller, William K., 16, 59
 Walsh, Frank B., 35
 Walton, Henry J., 9, 19, 25, 37, 77, 96
 Ward, Charles Monroe, 84, 86, 88
 Ward, Grant E., 10, 19, 27, 36, 66, 72, 73
 Waring, H. Glenn, 36
 Warner, C. Gardner, 10, 56, 96
 Warren, Frank Orville, Jr., 90
 Warthen, William H. F., 11, 64
 Webster, Thomas Clyde, 90

 Weeks, William E., 21, 24, 31, 63
 Weeks, William Earl, 16
 Wehling, Benjamin Bird, 93
 Weiland, Glenn S., 11, 56
 Weiss, Maurice Richard, 90
 Welch, Hugh J., 23
 Wells, Gibson J., 14, 24, 63
 West, George Brooks, Jr., 91
 West, R. D., 12
 Wheaton, H. Whitney, 15, 24, 63
 Whitehead, Hugh G., 13, 58, 61
 Whitehurst, Mrs. John L., 7
 Wich, Joseph Carlton, 90
 Wiegand, Edith J., 17, 56
 Wilder, Thomas C., 21, 22
 Wilfson, Daniel, Jr., 16, 59
 Wilkerson, Albert R., 15, 25, 66
 Wilkerson, J. Herbert, 11, 73
 Will, David Reid, 91
 Williams, Charles Herman, 84, 86, 88
 Williams, Huntington, 9, 64
 Williams, Richard T., 21
 Williams, Thomas Richard, Jr., 91
 Williamson, C. Vernon, 25
 Williamson, Edgar Percival, Jr., 84, 86, 88
 Williamson, Oliver Wayne, 90
 Willse, R. G., 11, 75
 Wilson, Julia E., 39
 Wilson, Mary Stuart, 93
 Wilson, Thomas Leslie, 90
 Winship, Emma, 22
 Wise, Robert Edward, 90
 Wise, Walter D., 8, 9, 28, 65, 96
 Wisong, Mrs. Georgiana, 37
 Wolfe, William D., 33
 Wolff, Thomas C., 11, 29, 33, 58
 Wollenweber, Henry L., 14, 57
 Wood, Austin H., 12, 70
 Woody, Arthur Overton, 90
 Wooden, Allen Curtis, 93
 Woodland, Virginia, 93
 Woodrum, Olic C., 93
 Woolley, Lawrence F., 10, 62
 Worgan, David Kuykendall, 90
 Wright, Robert B., 10, 56
 Wylie, H. Boyd, 8, 18, 56, 96

 Yaffe, Stanley Norman, 93
 Yeager, Clark H., 11, 58
 Yeager, George H., 11, 22, 24, 35, 66
 Young, A. D., 30
 Yurko, Leonard Emory, 90

 Zattf, Evelyn Byrd, 37
 Zeigler, Alice E., 93
 Zepp, Edwin Andrew, 84, 86, 88
 Ziegler, Paul Randall, 91
 Zimmerman, Loy Miller, 84, 86, 88
 Zimmerman, Muriel, 37
 Zinn, Waitman F., 9, 28, 29, 33, 70
 Zupnik, Howard L., 28, 32
 Zuravin, Meyer H., 28, 32



THE FRANK C. BRESSLER RESEARCH LABORATORY



UNIVERSITY HOSPITAL

**Return this book on or before the last
date stamped below**

--	--	--	--

